The Business Journal of Vegetation Management January 1978/$1.25

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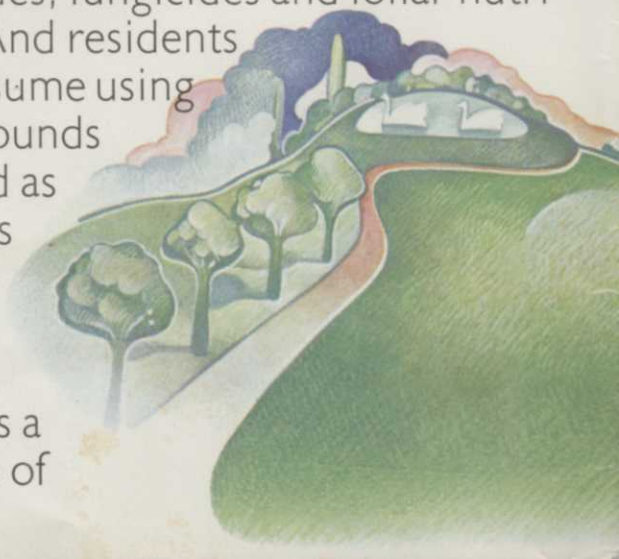

BACK.

four formulations—sprayable, wettable powder, flowables and SEVIMOL® 4, a liquid blend of SEVIN and molasses. Granules, dusts and baits are also available for certain specialized uses. Plus, SEVIN isn't harsh on the environment. It is biodegradable; and when compared with other insecticides, it ranks low in toxicity to people, animals, birds and fish.

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WT&T

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VIEWPOINT

As promised, we have provided you with an improved journal. What do you think? We'd really like to know. Just write down your comments on this or any matter on the new postpaid, reader comment card and send it to us.

I hope you will use the new problem solving columns, Vegetation Management and Proscape, to help you in your business. Or if you have a remark on any industry subject we'd like to see if others feel the same way. This can be accomplished in a letter column, which will premiere in the February issue.

We have had some feedback in regard to our desire to help bring a national affiliation of green industry associations to reality. It is apparent that to do this properly, months and years of planning and working together are needed. We urge everyone to avoid the temptation to rush into such an organization without the patient consultation of all industry groups and entities. We are certain that manufacturers would like to help, and of course all the trade publications. To build a solid and respectable foundation for lobbying efforts in Washington, D.C., there must be no taint of opportunism by any one organization or entity.

We urge the Golf Course Superintendents to sponsor discussions on such an organization at its national meeting in San Antonio. GCSAA has appointed a group to study such a cooperative effort for the green industries. The discussions should be many and held at all the various industry associations. Formation should occur as a result of cooperation among all the associations, and not by the efforts of just one group. To work it has to be comprehensive.

BRUCE SHANK
Editor

Applying engineering designs which "Sound Conditioned"* our industrial scrap reduction machinery, Mitts & Merrill can modify our brush chippers for low noise levels. At the same time, those engineering features which have made Mitts & Merrill the leader for years have been retained.

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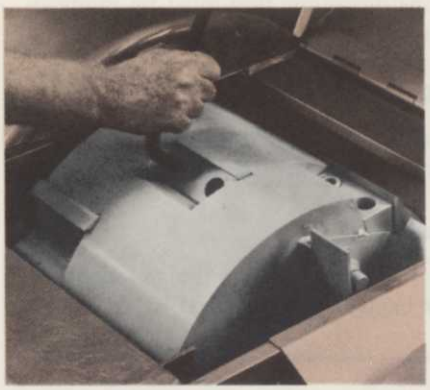
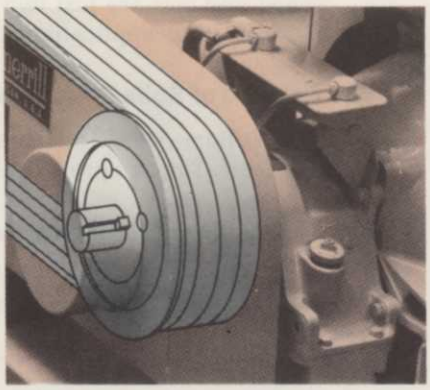


Staggered knife pattern, for years a Mitts & Merrill feature, has always resulted in a lower noise level. First, by segmenting the noise source. Second, through smoother cutting action. Third, by producing smaller chips.



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PEOPLE

The Board of Directors of The Davey Tree Expert Company announced the election of **Jack W. Joy** as president and chief operating officer. Joy succeeds Alexander M. Smith, who remains chairman and chief executive officer.

In a concurrent move, the board also elected **Martin L. Davey, Jr.,** to the position of vice chairman of the board.

Prior to his election, Joy had been senior vice president-operations. A veteran of 31 years with Davey Tree, Joy joined the company in May, 1946 in field operations. He was elected to the Davey Board of Directors in 1964 and was appointed vice president and sales manager in May, 1965. He is a member of the International Society of Arboriculture and the National Arborist Association.

Martin L. Davey, Jr., grandson of company founder John Davey, held the office of vice president-operations coordinator before his election as vice chairman of the board. Davey is also president of the Davey Investment Company and will continue in that office. He served the company as president from 1946 through 1961 and as chairman of the board from 1968 until 1972. He is a member of the Board of Directors and the son of the late Martin L. Davey, who was president of Davey Tree for 23 years and a former governor of Ohio.

Dr. Lynne C. Thompson has been named an extension specialist and assistant professor in the department of entomology at Kansas State University, Manhattan. Thompson, was a Postdoctoral Research Associate at the University of Minnesota.

In announcing the appointment, Dr. Richard Sauer, entomology department head, said Thompson will add important expertise in forest, ornamental, and shade tree entomology to the department's extension entomology programs.

A native of Minnesota, Thompson, earned a Ph.D degree in entomology from the University of Minnesota in 1976. He received an M.S. degree in entomology in 1973, also from the University of Minnesota. He received his B.S. degree in entomology in 1970 from Kansas State University.

Terry Anstett has been named Outdoor Power Equipment Group director of manufacturing by Toro Company Group Vice President K. B. Melrose. Anstett has been general manager of the Toro plant in Windom, Minn., since 1975.

Jack W. Joy

Terry Anstett

Thomas M. Carter

Joel H. Stonecipher

Anstett was previously director of manufacturing engineering for the outdoor power equipment group. Before joining Toro he was manager of manufacturing engineering for Wheel Horse Co., South Bend, Ind., and a quality control engineer for General Electric.

Thomas M. Carter has joined Jacobsen Manufacturing Co., as manager of engineering for the Turf Products Div., according to Howard L. McPherson, vice president and general manager of the division.

Carter will be responsible for the design and development of new products, improving current equipment, field and in-plant testing, experimental programs and cost analysis and comparision.

Carter was previously chief engineer for Van Dale, Inc., Long Lake, Minn., a farm equipment firm. He is a member of the American Society of Agricultural Engineers.

John F. Frawley, vice president of AMAX Inc., has been elected chairman of the board of the Potash/Phosphate Institute, Atlanta, Ga. Frawley is also a director of Roan Consolidated Mines Ltd.

Boyd R. Willett, president of Kalium Chemicals Div. of PPG Industries, Canada, was elected vice chairman of the board of PPI.

The announcements were made by outgoing board chairman **D. R. Gidney,** president of the Potash Co., of America.

Joel H. Stonecipher has been named Western district sales manager for specialty and technical products for Elanco Products Company, the agricultural marketing division of Eli Lilly and Company. He will be located in the Dallas, Texas area according to R. W. Collins, sales manager.

Stonecipher has been serving as a marketing planning advisor for Spike® at Elanco's corporate headquarters in Indianapolis, Indiana. He joined the company in 1965 as a sales representative, was promoted to a district manager in 1967, and named a marketing communications advisor in 1972.

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Your name_____

Organization_____

Address_____

City_____ **State**_____ **Zip**_____

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GREEN INDUSTRY NEWS

CHEMICALS

Velsicol indictment comes as shock

A Federal grand jury in Chicago has issued an 11-count indictment against Velsicol Chemical Corp. and six of its attorneys and employees. The counts include conspiracy to defraud, concealment of material facts, and failure to submit animal data during the chlordane/heptachlor hearings.

A Velsicol spokesman said the indictments came as a shock and that they are "indictments," not convictions.

Among those charged were past and present employees and lawyers retained by Velsicol for the chlordane hearings. Possible penalties range from 20 years incarceration and $31,000 fine to 55 years incarceration and $83,000 fine.

The hearings in the cancellation phase of chlordane are in final stages with a final decision due in February. Talks to reach a settlement are now underway.

The general feeling in industries using chlordane is that the product is often the most effective for some uses and completely safe when used by a trained and competent applicator. Velsicol has done basically what EPA has asked it to do throughout the hearings. Since there are either few or no precedents to go by, and rarely does a chemical company attempt to defend a product under EPA's scrutiny to the extent Velsicol has, the word fraud is even more suspicious.

The fact that the grand jury is charging Velsicol with insufficient reporting may be more a factor of unclear data requests instead of a criminal intent to withhold information. Cancer data requirements are still vague and standards to make any safety judgement by are still undetermined.

Kenneth Gregory of Florham Park, N.J., is presented the New Jersey Arborists Association's Arborist of the Year Award from Will Cass, Clark, N.J., last year's recipient, during its 40th Anniversary Dinner Dance in October.

TURF

Snow didn't scare Ohio turf show goers

Despite nearly ten inches of snow in two days, more than 1,200 persons interested in turf made it to Dayton for the Ohio Turf Conference in December. Fifty exhibitors received the full attention of delegates as the weather made staying indoors favorable.

The event started with a general turf session. Dr. Michael Hurdzan got right to the point as he explained how golf courses work to protect our natural resources. The Tennessee Valley Authority's research on sulfur-coated urea was discussed and slides showing its benefits as a slow release nitrogen source were shown. Robert Felix, Executive Director of the National Arborist Association pointed out the need for professional tree care in protecting those valuable aesthetic photosynthesizers. Tom Mascaro gave an insight to the value of the Turf Industry in Pennsylvania where it ranks as the second largest agricultural industry. Mr. Mascaro was of the opinion that it might rank first in Ohio.

The annual business meeting of the Ohio Turfgrass Foundation was sparsely attended in the afternoon. A general cry for more participation by members was called for by the president, Lou Greco. The planning of the 1977 conference was explained by committee chairmen, and new officers were elected. Merrill Frank is the new President-elect and Bill Hill was voted as the new vice president. Treasurer is Mark Yoder and Bill Burdick, Gene Buress and John Goodwin joined as new trustees.

The second day the group split into golf course and general grounds sessions. Some speakers presented their topics at both sessions so that nothing of relevance to either was lost. Dr. Harry Niemczyk's description of the Aetenius beetle's life cycle was particularly important. This is a relatively new discovery that is spreading and becoming more of a concern. Dr. Niemczyk, from the Entomology Department of OARDC, also explained an even newer pest discovery, that of the association of the winter grain mite with winter desiccation. The range of this mite is unknown at present and Dr. Niemczyk asked for assistance by notifying him if you discover this pest. It is a dark bodied mite and is easily distinguished by its red legs. Check for this mite next time you note winter dessication.

The third day the general grounds session gave way to professional lawn services. Dr. Roger Funk of Davey Tree Services gave a rundown on soil pH and its adjustment and Herb Day discussed tank mixing of pesticides and pesticide fertilizer combination, among other topics.

The final morning the groups split again and many more areas specific to fine turf management

were put into perspective. Problems and the technology to control them are a necessary part of good turf management, as the attendance at this annual conference would indicate.

Throughout the show speakers were available at a special consultant's corner booth to answer questions.

AGRONOMY

Watson is presented agronomic award

The American Society of Agronomy has named Dr. James R. Watson as recipient of its 1977 Agronomic Service Award. Dr. Watson, vice president for customer relations of The Toro Company and that company's principal agronomist, is an internationally recognized expert on turfgrasses. He is the author of a number of articles dealing with various phases of turfgrass care and management. Dr. Watson's research has been concentrated on fertilization practices, winter protection techniques, snowmold prevention and the adaptability of various species and strains of turfgrasses.

Dr. Watson earned a bachelor of science degree in agronomy at Texas A & M University and his Ph.D. at Pennsylvania State University. He is a member of the American Society of Agronomy and the Crop Science Society of America. Last year Dr. Watson received the United States Golf Association's Green Section Award for distinguished service to golf through his work with turfgrass.

The American Society of Agronomy, a 9,400-member scientific educational organization, established this award to recognize the development of agronomic programs and practices and effective public relations programs aimed at promoting the understanding and use of agronomic science and technology by the public.

LANDSCAPE

Kentucky clinic to feature experts

The Landscape/Garden Center Management Clinic, co-sponsored by the National Landscape Association and the Garden Centers of America, will be held February 5-8 at the Galt House in Louisville, Kentucky. The four day program will feature such authorities as Prof. James B. Sinatra, John Trocke, Eric P. McCarty, Tom McDonald, Jr., Melvin Brady, and Robert Garton.

Sunday afternoon, Feb. 5, is devoted to NLA Committee Meetings. A "How I Do It" session will be held in the evening featuring subjects such as "Efficient Planting," "Guarantees," "Design Sketches," Soil Additives" and "Mulches."

Monday the focus is on landscape. Subjects include: What's Happening in Residential and Small Commercial Landscape Design, the NLA Awards Luncheon and Accounting for the Non-Accountant.

Tuesday is a day for everyone. New insights on communication: top management with middle and middle with top will be presented. Panel and group discussions plus a presentation on Analyzing Operating Costs will be offered.

Wednesday, the focus is on garden center operations. The theme for the day will be "New Challenges Facing the Nursery Industry" with session subjects such as: How to Sell a Half Million a Year and Net 15% in a Retail Nursery and How the Public Sees My Staff.

NURSERY

Cal Poly alumni to create curriculum

The Ornamental Horticulture/Park Administration (OHPA) Alumni Association of California State Polytechnic University at Pomona, is now working to establish a continuing education program for the professional and interested amateur in conjunction with Kellogg West, Cal Poly's Center for Continuing Education, according to James Prusa, newly elected president of the group.

Prusa also said unveiled OHPA plans have been formulated to benefit the rapidly expanding organization membership.

Other officers include Mary Olson of Environmental Care, vice president; Chris Greenwood of Armstrong Nurseries, secretary; Rodger Duer of Cal Poly, treasurer; and the following directors: Richard Greer of Pomona Wholesale Nursery, Donna Browne of Target Chemical Company, Ken Jones of Armstrong Nurseries and past president John Provine of the Los Angeles County Arboretum.

Persons interested in the OHPA alumni organization may contact the alumni affairs office at Cal Poly, Pomona, 714/598-4748, for further information.

IRRIGATION

Andrus agrees with irrigation rule delay

Secretary of Interior Cecil Andrus has agreed that the Bureau of Reclamation will postpone any final regulation regarding the use of federally funded irrigation water until March 1, 1978. Proposed regulations, issued by the Bureau on August 25, contained stringent acreage provisions (160 acre limit) and residency requirements that generated support for legislation calling for a moratorium on the implementation of the regulations pending a 12 month review of the present federal reclamation law.

CHEMICALS

Mirex OK'd for fire ants in S.C.

EPA has approved aerial application of Mirex to control fire ants in certain coastal South Carolina counties, provided that the State complies with modifications made by EPA in the S.C. plan.

The approval required that the treatment area be modified to prohibit aerial application: (1) "To any aquatic areas, except for intermittent streams where there is no flow and except for man-made or natural impoundments of water which do not exceed two acres in size and are not commercially fished. However, even these exempted waters should be avoided where possible." (2) "Where runoff or flooding will contaminate aquatic areas." (3) "In contiguous wooded areas except for a 100-yard swath contiguous to treated areas . . ."

The approval specified two Colleton County areas which cannot be treated. It also requires the State to perform human, environmental and application monitoring of the Mirex treatment and to have certification by a State official of an inspection for fire ant infestation.

CHEMICALS

Trichem applies for fire ant product

Trichem Industries Corporation has applied for a changed use pattern to register Trichem TCE. They propose that the use pattern of the pesticide, includes use as a fire ant fumigant.

GOVERNMENT UPDATE

Heptachlor/Chlordane Hearing To Close

The heptachlor/chlordane case is in its last stages after almost two years of hearings. A final decision by EPA Chief Administrative Law Judge Herbert L. Perlman will be due about the first week in February, 1978. EPA and Velsicol lawyers, meanwhile, are debating over some type of settlement agreement.

Officials were not optimistic about a settlement, but noted that the briefing schedule would be followed, regardless. Indications are that EPA and Velsicol will continue to try and work out some type of settlement even after their initial briefs are filed.

Some EPA officials seem to envision a settlement with some major uses, such as on corn, being continued for a while and then phased out. Because of the greater complexity of the heptachlor/chlordane controversy and the number of uses involved, many observers do not foresee a settlement.

Cadmium Extended, Benomyl RPAR Issued

A rebuttable presumption against registration against cadmium was extended to February 10. This RPAR effects 35 turf chemicals.

An RPAR against benomyl, a systematic fungicide used on turf and ornamentals, was noted in the December 6th Federal Register.

Additional chemicals that have been designated for pre-RPAR reviews include: Dimilin, a gypsy moth insecticide; Telone, a soil fumigant and phosphorus paste, used in insecticides and rodenticides.

Du Pont Will Rebut EPA RPAR on Benomyl

The Du Pont Company has announced intentions to rebut the EPA notice concerning presumption against their product "Benlate" benomyl fungicide. Results from extensive scientific tests and from years of world-wide field use show that use of "Benlate" to protect food crops does not represent a risk to man or the environment, according to the company.

Grower, fieldman, and investigator comments and views on benefits of "Benlate" have been requested and will be of special interest to the EPA. Letters to the EPA should include specific information on crops and acreages treated, disease control experienced, benefits observed in terms of improved yield or improved quality, plus facts on previous (or alternate) ways to handle disease problems in various crops and economic value of crops protected.

Letters should be sent in triplicate to: EPA, Office of Pesticide Programs, Federal Reegister Section (WH-569), 401 M Street, S.W., Washington, D.C. 20460. Letters should also carry the notation OPP-30000/23 for correct identification with the RPAR notice on "Benlate."

Pennwalt Issued Experimental Use Permit

An experimental use permit has been issued to Pennwalt which allows use of approximately 5,114 pounds of an insecticide mixture of O,O-diethyl-O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorotioate and aromatic petroleum solvent to evaluate control of insect varieties in residential, industrial, food processing and business sites, and on ornamental trees, shrubs and turf. The permit expires Oct. 14, 1978.

NEWS

NURSERY

AAN forms council for national promotion

The Nursery Marketing Council is the most recent addition to the activities of the American Association of Nurserymen. The council has been established to supply the nursery industry with professional market research and analysis and the resulting advertising and public relations to increase the sale of plant material and related products.

Forty-seven firms have agreed to participate so far. Each of the wholesale nursery growers will add ¼ of 1% of value of plant material to all invoices under Nursery Marketing Council Contribution. If the customer honors this voluntary contribution, the grower will match it and forward the total to the NMC.

The NMC is managed by the staff of the AAN and supervised by its marketing Committee with ultimate authority resting in the Board of Directors.

J. Frank Schmidt, Jr., whose wholesale nursery operation is headquartered in Boring, Ore., is the first industry executive to take on a leadership role in the NMC. His assignment is to establish a committee responsible for enlisting early endorsement and support from a number of major wholesale growers nationwide. Schmidt hopes to build a $100,000 to $200,000 fund the first year to support NMC market research and the resulting consumer advertising.

Ketchum, MacLeoad & Grove, a 54-year-old marketing organization, which ranks 23rd among all U.S. agencies in billing volume, has been selected as the national advertising agency which will provide the consumer research and marketing services planned for the all-industry program of NMC.

TURF

Ohio research center to build rhizotron

The first turfgrass rhizotron is being constructed at turfgrass research plots maintained cooperatively by OARDC and Ohio State

Continues on page 43

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SELECTING THE PROPER SPRAY APPLICATION SYSTEM

By Ron Morris, Assistant Editor

Environmental concern and EPA regulations make it impossible for an applicator to even contemplate a mistake involving chemicals. It is of the utmost importance that a competent applicator select and use the best equipment in a manner consistent with the environment and the pest to be controlled. While equipment varies, there are general guidelines for chosing a rig that will do the job for you.

A sprayer should be designed for the particular use intended. It should be a quality piece of machinery that is easy to fill, operate and clean. There are basically three types of large sprayers.

Low Pressure Boom Sprayers

This type of sprayer is designed to deliver a low to medium volume of spray at approximately 15 to 50 PSI. The advantages include relatively low cost, versatility and a medium to high capacity. They are limited by a low output if high volume is required. Low pressure tends to limit pesticide penetration into the foliage. There has also been some problems with agitation in this type of sprayer.

Hydraulic Sprayers

Hydraulic, or high pressure, sprayers are designed to spray large volumes of material at high pressures. Their advantages include being well built to withstand the higher pressures. They can also be converted to low pressure spraying with the proper pressure regulators.

Air Blast Sprayers

Also called mist sprayers or foggers, these units use a high speed, fan-driven stream of air to produce a fine mist that moves with the air stream. This stream can then be directed to either or both sides as the unit moves forward. Most of these types of sprayers can be adapted to apply either high or low volumes.

Because of the higher pressures used, often as much as 350 psi, good penetration and coverage are advantages gained. There is also low pump pressure. Pumps can move as little as 10 gallons per minute. However, because of the fine mist produced, there is a tendency towards more drift. It is also hard to limit the spray to the target area.

Tanks

A spray tank should have a large opening for filling and cleaning. This is essential for economic use. In addition, the tank should have qualities that will withstand the corrosion of any chemical you might use in it.

The tank should have a good, easily accessible drain. You should be able to quickly flush the tank, pump, lines and nozzles after a day's use. Make sure the gauges can be read easily and quickly.

Pumps, strainers and hoses should be selected with the thought in mind that the tank is only as good as its parts allow it to be.

Pumps should be of adequate strength to supply pressures for all of your spraying needs. They should resist corrosion and abrasion. You should use the right pump with the right material. For example, wettable powder formations will quickly destroy a gear drive pump.

Strainers should protect the working parts of the sprayer to avoid any misapplication due to clogged nozzles. They should be cleaned after each use. Strainers provide a defense against pump and nozzle wear and clogging.

Three methods for spraying large turf areas; the boom sprayer, the mistblower, and the helicopter. Cost of application is proportional to the application speed. The helicopter is the most expensive but the fastest.

Hoses should have a burst strength greater than any peak operating pressure. They should resist any corrosive effects of the material passing through them.

Be sure you check your pressure gauges often for accuracy.

Agitation

Agitation systems have traditionally been limited in their effect. Bypass agitation can be good enough for solutions and emulsions but it is best to use either jet or mechanical agitation for wettable powders. Mechanical agitation has been the best way to assure the best possible agitation. Work is being done on a sparge-line agitation system that is showing much promise. Basically this system picks up material from the bottom of the tank and, by means of a turbine pump, recirculates the material, via aparge-lines, back into the top of the mixture.

Nozzles

The standard nozzle used on boom sprayers is the flat fan with tapered edges. Spaced at regular intervals across the length of the boom, these nozzles provide an overlapping, tapered edge that produces an even spray the length of the boom. These nozzles have degrees of spraying angles that allow variation in their separation width, and boom heighth. For example, a series of 80 degree nozzles

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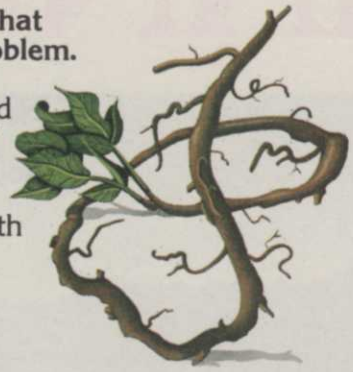

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may be spaced at 20 inches with a boom height of 17 to 19 inches while a 65 degree series of nozzle might be spaced at 20 inches with a 21 to 23 inch boom height.

It is usually best to standardize the nozzles on various pieces of equipment, which limits confusion and requires a smaller item inventory.

Manufacturers typically publish charts with their catalogs that describe the various nozzles, their best functions and capacities.

Hollow-cone type nozzles are often selected for use on boom sprayers when applying pesticides. This type of nozzle produces, as its name indicates, a hollow cone of spary. The pattern is circular with tapered edges and little or no spray in the center. Its main advantage is better foliage coverage. Material is usually applied at higher pressures with this nozzle, assuring even better foliage coverage.

Boomless flooding nozzles are often used to apply liquid fertilizers. This nozzle works at lower pressures than the fan type nozzle and gives a fairly uniform coverage across its width. The wide off-center nozzles are also used in boomless spraying. They can also be used to extend the effective swath width of a boom when attached to the ends.

Many nozzles can be used for spraying more than one type of material. Some general guidelines are: for weed control, select either a regular flat fan, flooding fan or hollow cone; for fungicides, use either a hollow or solid cone; for insecticides, use a regular flat fan, or a hollow or

Mistblowers

by William Burdick, Canterbury Country Club, Beachwood, Ohio

We started mist blow spraying at Canterbury about five years ago and it has developed into our primary means of applying fungicides to fairways.

The equipment we're using is a small, three point hitch mist blower from Myers. We bought this machine in 1972, more or less as an insurance policy, in case during our PGA championship in 1973 we had to get out there and do a fast spray job. We did not buy it to be our primary piece of spray application equipment, although it has turned out that way.

The biggest factor in favor of mist spraying is time saved. With a boom system it was taking us anywhere from a day to a day and a half, with play on the golf course, to spray all our fairways. With the mist blower we've gotten that time down to two and a half hours or five hours, depending upon the method we're using.

Our program at Canterbury is to spray each week, and we do this religiously. We use all chemicals at half rate. We've found this to be very effective since we spray once per week.

The first week we'll spray down the center of the fairway blowing out both sides of the machine. Our fairways average 90-120 ft. wide and we can easily cover that.

The second week, and this is where we came up with five hours as opposed to the two and a half hours, we'll spray one side of the fairway, then back up the other. We're actually getting double coverage that way, still using the chemical at half rate. We also find that there is a benefit because the machine has a boom directly underneath the tractor.

If we have to operate in a wind of more than six miles per hour we're losing a great deal of effectiveness. The operator can, however, become accustomed to using the wind to some advantage.

Morning applications are of benefit because of the dew. We're using 20 gallons per acre so we like to spray in the early morning when we have dew cover. I can't honestly say we've seen any noticeable difference in the amount of control between spraying on mornings when we do or don't have dew.

One of the disadvantages of this early morning application is the noise level. The fan on the sprayer plus the high tractor rpm that's needed are loud. We've had few complaints but if you have close neighbors or apartment buildings, I'm sure that this could be a problem.

An advantage of mist spraying is that the machine can be operated in almost any kind of weather condition. If you have a very wet situation you don't have to drive on the fairway — you can drive down the sides. This has saved us many times. In a pythium situation, we can get out there after any kind of rain storm, doing no damage to the fine turf, and still getting a beautiful application of chemical.

I think the mist blower is pretty much goof-proof. We've had no trouble at all with calibration. All you have to do is know your ground speed and pump pressure and the nozzle size takes care of the rest.

It's also a very low maintenance piece of equipment. I think the biggest problem, or the thing that you have to watch the closest, is nozzle size and wear, because you're operating at about 350 lbs. of pressure.

We were using brass tee-jet nozzles and found that we could only spray 18 holes of fairways about twice before changing nozzles. Since then we've changed to the same round steel nozzle that we use in the blower manifold and we only have to change those about twice a season.

There are many different types of stainless steel and hardened steel nozzles that can be used. It becomes a systematic thing to know exactly how much chemical we're going to use on an 18 hole fairway application. For example, if we don't have that extra 10 gallons left over to spray the practice tee area, we know it's time to change those nozzles.

Unlike boom spraying, where you're operating at low pressure nozzle clogging is not a problem.

The mist blower solved the problem of disease control in rough areas around our greens where it's just too tight to get any kind of boom spray equipment in. We can go up around the green very easily and we do this about three times a year. If we get into a situation where we can't get on the green or tee to spray with our regular equipment, we can give it enough of a shot with the mist blower to hold until the weather dries up.

We used to find that leaves were a problem on the fairway. A lot of times we were putting more chemical on the leaves than we were on the grass. We didn't have time to get out and clean them up before we sprayed. With the most blower there was enough air blast to get the fungicide to the turf.

One of the primary things you must do is to be sure your operator has the proper protective clothing. We require they wear a rubber suit and respirator. We also require them to take a shower as soon as they are finished spraying. WTT

solid cone; to minimize drift use either a flooding fan or whirl-chamber hollow cone and keep operating pressures low (below 30 ps.).

Nozzles are made from many different materials. The best buy is the cheapest that will withstand your use of it. Brass is the most inexpensive, but also wears the quickest. If you are using an abrasive material, brass will not last long. Stainless steel is more expensive, but will resist corrosion and abrasion, especially if hardened. Plastic also resists corrosion and abrasion, but tends to swell when exposed to some solvents. Aluminum resists some corrosive materials but is easily corroded by some fertilizers. Tungsten carbide and ceramic nozzles are highly resistant to corrosion and abrasion, but are also expensive.

Nozzles should periodically be checked for uniformity of application. This can be accomplished by allowing each nozzle to fill a calibrated jar in a specified time. A nozzle should be replaced if its flow is 5% more or less than the average.

A good way to check nozzle pattern is to spray water over a stretch of asphalt. Watch for streaks as you increase speed or the spray dries. Replace any nozzle that has a faulty pattern. Nozzles should never be cleaned with any material that is as hard as, or harder, than the material of the nozzle. A toothpick works best.

Sprayer Calibration

There are many ways to calibrate a sprayer. Some are more difficult than others and some are downright abstract. One of the simplest methods is to fill the spray tanks and spray for a specified distance. Then measure, in gallons, the amount it takes to refill the tank.

Determine the total square feet in the test area by multiplying the spray width by the length of the area. A simple ratio can be set up and the total square feet one tank will spray can be calculated.

For example: If your spray width is 10 feet and you spray for 1000 feet, your test area is 10 feet X 1000 feet, or 10,000 square feet. If it took 10 gallons to spray that area, you set up a ratio as follows:

$$\frac{\text{10 gallons to refill spray tank after one pass}}{\text{10,000 square foot test area}} \text{ Equals } \frac{\text{100 gallons in a full spray tank}}{\text{unknown area that a full tank will cover}}$$

Then: **100** gallons in a full tank X **10,000** square foot test area or **1,000,000** gallons square feet equals **10** gallons to refill the tank times the unknown area. Dividing **1,000,000** gallons square feet by **10** gallons gives and unknown area equal to **100,000** square feet. If you wish to have this number in acres divide by 43,560 square feet per acre. This gives a total of **2.3** acres. Then if you want to know how many gallons you are spraying per acre divide the number of gallons a tank will hold by the number of acres you have calculated it will spray. In this case it is **100** gallons divided by **2.3** acres or **43.5** gallons per acre.

Its all as simple as supplying your own figures for the underlined numbers above and carrying thru the problem.

Mixing chemicals

Following Environmental Protection Agency regulations is the first law of mixing pesticides in any spray tank. According to the EPA regulations, a mixture is handled as if it were a new pesticide. If the label does not indicate a combination, then one should not be prepared.

There are, however, other aspects of tank mixing that should be considered also. Incompatibility of chemicals is a common problem. Incompatibility can be the result of a reaction between the components of a mixture, or it may be caused mechanically, as with flocculation, or one chemical can be absorbed and treated preferentially by the carrier of another. In any case, the properties of the chemicals are altered and you risk loosing effectiveness, or worse yet, plant damage.

Wettable powders are generally well adopted for use in mixes. Emulsions may cause flocculation. The application of pesticides as solutions can cause some problems. The fact that the compound is water soluble often increases the chances of a reaction when mixed with other compounds.

It is possible to overcome in compatibility problems by the use of a proper adjuvant. Improper use of an adjuvant however, can also cause damage. Adjuvants can also eliminate the selectivity of herbicides thus causing plant injury.

It is possible to pre-check the stability and compatibility of various chemicals. By using conversion figures, determine the amount of chemical needed to mix one pint of chemical spray mixture. Mix one pint in a quart jar, using the same procedures you would if it was the spray tank. Put a lid on the jar and shake until the mixture is well dispersed.

If the materials remain in suspension for a reasonable period of time or if they are easily redispersed by shaking, good agitation in the spray tank will ensure even spray coverage.

If, however, the chemicals rapidly settle to the bottom of the jar or form a messy precipitate, further testing with an adjuvant is necessary.

Prepare the same mixture in a second jar and add approximately ⅓ teaspoon of the proper adjuvant (check with your dealer first). Again, shake and observe the results. If they are not satisfactory, you may continue testing by altering the amount of adjuvant or changing to a different one. If the results remain unsatisfactory, do not attempt to use that mixture in your spray tank.

Alkaline Hydrolysis

Alkaline hydrolysis is the process whereby a chemical mixed with water of sufficient alkalinity undergoes a reaction that destroys that chemical's effectiveness. In many areas of the U.S. the water has sufficient alkalinity to cause such a reaction.

If you suspect your water, it is best to have the pH determined by a testing laboratory using a pH meter. Standard litmus paper and color strips may often be off as much as one or two pH units.

If the water pH is higher than 7.5, it is enough to affect some pesticides. In general, insecticides are affected more severely than are fungicides or herbicides. Carbamates and organophosphates are broken down more rapidly than are chlorinated hydrocarbons.

Adjuvants, again, are the answer. Sold specifically for this purpose, they can lower the pH of

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your water into the more acceptable 4-6 pH range. Consult your pesticide dealer for a compatible adjuvant for this purpose.

Fungicides containing copper would not have the water adjust for pH. The acidity may cause enough copper to solubilize that it will cause plant injury. Sprays containing lime should not be acidified for obvious reasons.

Disposal of Pesticide Containers.

EPA regulations call for no pesticide related materials to be disposed of by open dumping, open burning (except small quantities of combustible containers not in excess of 50 pounds, or those emptied in a single work day — whichever is less and which did not originally contain organic forms of mercury, lead, cadmium, arsenic, beryllium or selenium), or water dumping.

However, it is interesting that the EPA would state in its publication that "Since adequate disposal sites and the necessary facilities are not readily available nationwide, and since significant information gaps exist which make it infeasible to write specific criteria for certain disposal methods; and procedures, prescriptive regulations requiring specific methods of disposal should not be insured at this time. The Agency has, however, elected to issue prohibitionary regulations to limit and constrain the worst acts listed above." WTT

Helicopter spraying

by Charles H. Tadge, Mayfield Country Club, South Euclid, Ohio

We've been using an aerial program at Mayfield, primarily for fungicide application, for the past eight years.

Shortly after moving to Mayfield in 1967 it became evident to me that a regular, preventative fungicide program was necessary since our turf was a combination of bentgrass and *Poa annua*, the greater portion being poa.

Mayfield was built on very rugged terrain. There are numerous steep slopes on the fairways. This makes pulling tractor drawn spray rigs very difficult. In those early years we were cursed — we're always cursed with poorly drained heavy clay soils — but in those early years we seemed to be cursed with perpetual wet weather. This really made spraying and even mowing difficult to accomplish without damaging the turf surface.

Our three primary fungal problems were and continue to be Helminthesporium leaf spot, dollarspot, and snow mold.

We tried substituting a boomjet spray rig for our regular boom rig. This gave us better coverage and consequently fewer passes on the fairway and fewer tracks, but still it was more susceptible to wind drift and not quite as exact, and it still didn't completely eliminate the problem of traversing the hills and subsequent marking of the surface.

In 1969, we became aware of a helicopter spraying service that was available in northern Ohio. Several courses were using their services and opinions were varied but mostly favorable.

During the winter of 1969-70, we found that snow mold incidence on our fairways was quite severe, despite treatment the previous fall. On the first of March snow coverage melted, but the snow mold fungi were still active. With more cold weather and snow very probable, it was imperative that we treat the fairways. Ground conditions were such that we couldn't drive on the course with anything so arrangements were made for the helicopter to come in and spray our fairways. This was done on March 3, 1970.

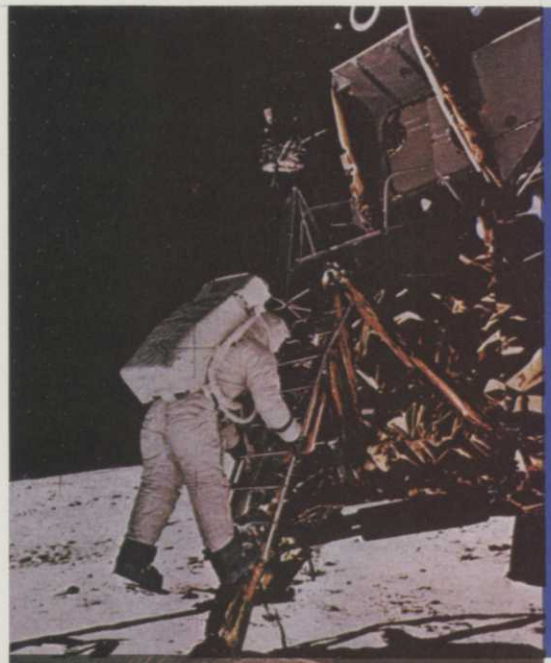
We were so impressed with the apparent coverage and speed of completion that we decided to try a complete program in 1970. That year they charged us $160 per application and we furnished the chemicals. As might be expected, next year the price rose to $240 per spray. Due to both price increase and the unavailability of the helicopter on a few occasions when we needed it, we only used the spray two times in 1971.

After carefully analyzing the relative cost, we felt we could still justify aerial spraying and we went back to a complete program in 1972. We have continued the service on a regular basis since 1972 with an average of about eight sprays per year.

We don't rely 100 percent on the aerial spray program. Like any course we've got perennial trouble spots where disease, particularly dollar spot, seems to persist, so periodically we'll touch up these areas as needed with our boom spray.

We're presently the only course in northern Ohio that's using an aerial spray program on a regular basis. Several courses have used the service occasionally for spraying fungicides. Two courses have been sprayed for grubs and report good control. They have also sprayed one course for broadleaf weeds on fairways with good success. Usually once a summer we've had Mayfield sprayed for control of mosquitos.

Continues on page 25



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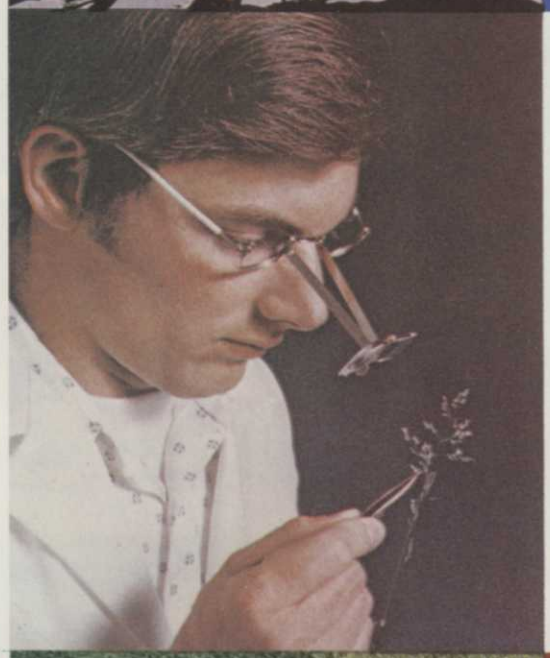

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Helicopter
from page 22

Probably the greatest single factor in the success of an aerial application is the effective performance of the pilot. We've been fortunate to have the same pilot over the past several years. He learned to fly in the service, had quite a bit of experience in Vietnam, and is very capable and conscientious. Last winter he became the owner of the company.

Actual spraying time involved at Mayfield has been about an hour, with an equal amount of time needed for filling and mixing chemicals. The helicopter is calibrated for an application of five gallons per acre at 35 miles per hour. Effective swath is 40 feet. Droplet size is very fine. Proper droplet size is very important to take advantage of the rotor wake and also to minimize drift.

Naturally, wind is a very significant factor. We try to spray when the wind is five miles per hour or less.

The helicopter is like a giant airblast machine. Several million cubic feet of air are moved rearward and downward during flight. When flown at heights of less than 10 feet, the rotor wake effectively drives the material into the foliage. Swath width increases as height above the ground increases, but drift potential also increases.

There are curls formed at the ends of the rotor wake called vortices that disappear last into the foliage, presenting a reliable, visible indication of swath width at air speeds of less than 35 miles per hour.

The helicopter's maneuverability and agility to work in close spaces is a paramount asset. We found that pocketed greens may get too much material if the helicopter backs into the pocket and then sprays out from a standstill position. This can be eliminated by coming in over the trees and suddenly dropping down to the surface to be sprayed. You have to have a good pilot for this. Some pilots don't want to use this technique.

The cost for spraying is presently $300 per application. An analysis has shown that spraying with our equipment would cost between $170 and $200 per application. This includes wages, payroll taxes, gasoline, equipment maintenance, and depreciation. This still falls short of the $300 price we pay for aerial spraying, but there are other factors to consider. It frees a key employee and tractor to perform other tasks. No ruts, soil compaction, or tire spins ever occur, no matter how wet the soil surface may be. When adverse weather threatens and fungal diseases are active or imminent, the spraying can be accomplished very quickly.

The prime question which must be asked is how much is it worth to have all the fairways and greens sprayed in one hour with no tractor sprayer interfering with the golfers or other maintenance operations. We feel these factors justify the added cost for aerial spray.

Another factor that might be worth considering for some courses would be the use of EPA restricted chemicals. If the course personnel were not certified to apply these chemicals, the helicopter service could be contracted to perform the function. All hazards inherent with the handling of the materials could be born by the aerial spraying applicator.

In conclusion, aerial spraying by helicopter may not be the ultimate answer. It may not fill everyone's needs, but at Mayfield we are well satisfied with the results we have experienced. WTT

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THE SCIENCE OF SOILS FROM NEW TURF HANDBOOK

William H. Daniel, Ph.D., Department of Agronomy, Purdue University, W. Lafayette, Ind.

Soils are composed of particles of an infinite variety of sizes and shapes. The soil profile, as described and classified by state and national surveys, is the result of gradual changes that have occurred during soil formation. More than 7,000 natural soil types have been identified and classified in the USA. Indiana has 36 groups of soils which include more than 700 types. A soil is typed according to its texture — sand, silt, clay. Soil types also reflect the parent material, drainage, climate, and vegetative growth associated with the soil during its formation.

Organic matter, the residue of plant decay, creates specific characteristics in the soil profile. The tall grasses of the prairies helped to create the deep black topsoils. The northern pine forests on the sandy soils in Michigan helped to create a leached organic upper and a dense lower soil horizon. Soils under hardwood forests are medium dark because they contain medium amounts of humus. Soils developed under low rainfall and high temperatures have little organic matter.

Dr. Daniel is in the final stages of writing his new "Handbook for Turf Managers." The book has 39 chapters on topics such as Management, Grasses, Rootzones, Pest Control, and Turf Uses. The new book will be available from Harvest Publishing Co. this spring.

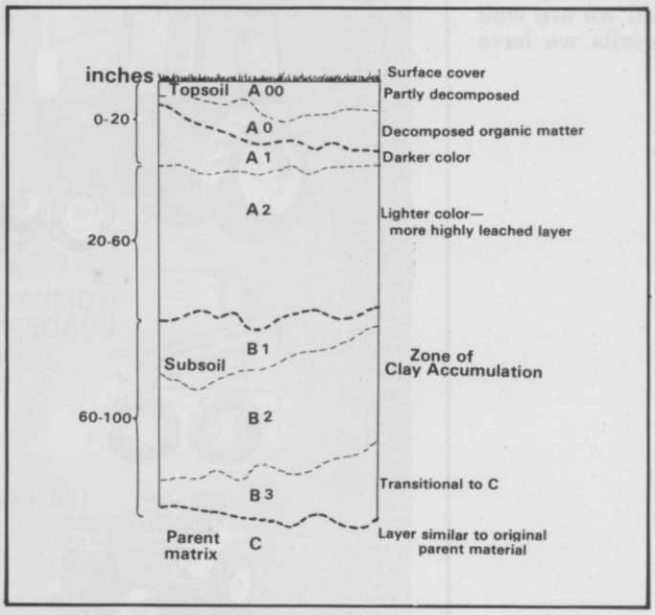

Figure 1: Drawing of a typical soil profile.

A. Source Of Parent Material

An infinite variety of physical and chemical forces have combined to create the different soils. Some of these forces are volcanic eruptions, freeze and thaw, mountain stream erosion and flash floods. Those big rough boulders of the mountain streams eventually become the gravel of the river, the sand of the shoreline, the silt and clay of the flood plain and the clay of the delta and the ocean floor. The process of erosion, grinding, wearing and sorting helps to produce many soil types.

Freezing and thawing as a weathering process is powerful. As water freezes it expands 9% or 1/11th of its volume. Every chip, crack or crevice becomes a pressure point. As the rock flakes, its surface is exposed to the weather's attack on its solidarity. Weathering is a process affecting all particles, tending to continuously subdivide them. This earth's covering is thin because weathering is primarily a surface phenomena.

The natural processes of soil formation are continuously at work. When soil particles are moved by water, gravel and sand particles settle quickly but move as the currents change. Clay settles slowly, and as a result, moves into deeper water where dense layers are formed. Periodically, a flood of incoming water contributes silt and sand to the clay layers. Eventually, the water level changes, the lakes dry up, the poorly drained flat plain is left with productive clay or clay loam soils.

In portions of Canada and central United States the glaciers of the ice age moved the material that other forces had assembled. Boulders were transported hundreds of miles, topsoil was stripped to bedrock (some areas in Canada), lakes were gorged (Finger Lakes of New York), old river valleys were buried (Teas River of Indiana), and new rivers formed (Ohio River). As the glaciers melted, their terminal moraines became gravel and sand deposits. Undulating as well as level land was left stony, or, in some cases, remarkably free of stones. Large gravel and sand deposits were created by the sweeping power of outwashes.

Winds play a continuing part in soil deposition or structure. The huge loess deposits downwind (east) of the Mississippi River, the sand ridges along creeks and lakes, and the sorting process across the deserts all illustrate the force of the wind.

Vegetation tends to stabilize soil surfaces as well as to produce organic matter for a multitude

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of organisms. As these organisms feed and die they effectively contribute to the granulating and structure creating processes of soils. The decay of plant parts accompanying the release and recycling of elements used in plant growth are fascinating conservation phenomena.

Chemicals and clays carried into the oceans gradually become sedimentary layers of limestone, sandstone, shale and other rocks. When lifted by geological forces, such as earthquakes, the new land exposed joins in this cycle of constant change.

Chemical processes, such as oxidation, solution, hydration, and carbonization, are constant acting factors making soil formation a continuous process. The result is the textured and structured soil that anchors the plant and serves as a reservoir of nutrients, water and air.

The different layers or *horizons* constitute the soil *profile*. The "A" layer of the profile is the zone of organic accumulation, the darker colored, structured topsoil. The second layer or "B" horizon, is made of clays and other fine particles collected as fragipans, or dense clay layers and subsoils. The "C" horizon is the parent material, which has been less affected by weather, water and organic matter interactions.

Many soils of western North America tend to be less developed since they have received limited water action in the recent geologic past.

B. Soil Texture

The sizes and shapes of soil particles determine the soil texture. The infinite variety of sizes are classified as colloids, clay, silt, sand, gravel and stone. Clay, silt and sand contribute most to soil-plant relationships.

B-1. Soil Texture Classification

Soil separate	Diameter	Particles/gm	Surface area in 1 g.
	mm	number	sq. cm.
stone	over 25	-	-
coarse gravel	25-5	1	-
fine gravel	5-2	30	-
very coarse sand	2-1	90	11
coarse sand	1.0-0.5	720	23
medium sand	0.5-0.25	5,700	45
fine sand	.25-.1	46,000	91
very fine sand	.10-.05	722,000	227
silt	.05-.002	5,776,000	454
clay	below .002	90,260,853,000	8,000,000

The intermix of particles has been classified into soil types based on the predominance of the fractions involved. (See Fig. 2). Sandy clay loam soil has only 20% clay but it is identified as such because clay particles characteristically standout. A soil must have more than 50% sand before it can exhibit the characteristics of a sandy soil. Silt particles act individually unless captured as organic aggregates or fragipans.

Cracking and fracturing of the soil is minimized when the clay content is less than 30% and is diluted with sand and silt.

C. Soil Structure

Soil structure is determined by the arrangement of soil particles within aggregates, granules and clods. Cations, colloids and humus contribute to their formation and stability.

Most clays have a net negative charge which allows the particles to join with positively charged ions such as calcium (+2). Bacteria and fungi produce secretions and decaying plants release compounds which cement particles together.

D. Topsoil

A medium sandy loam topsoil containing sufficient organic matter (5-10% by volume or 2-3% by dry weight) should be well granulated. The degree of granulation is expressed as the percent of the silt and clay content occurring as aggregates. A soil with 60% aggregates is considered to have good structure.

Aggregates of soils created by binding agents, colloids, cations, humic acids, and decaying organic matter are more stable to the forces of water. In comparison, aggregates formed by physical forces such as wetting and drying, freezing and thawing, and /or tillage operations are relative unstable.

In general, topsoils which drain well enough to allow air into at least 25% of the pore space (or 10% of volume) within twelve hours of saturation are considered satisfactory for most uses.

E. Topsoil Standard

The British (B.S. 3882:1965 of British Standards Institution) have identified topsoil into categories:

Topsoil is the existing surface layer of grassland or cultivated land. It is usually a darker shade of brown to black because of its organic matter content mixed with the mineral matter. Topsoil tends to be friable and show some degree of poros-

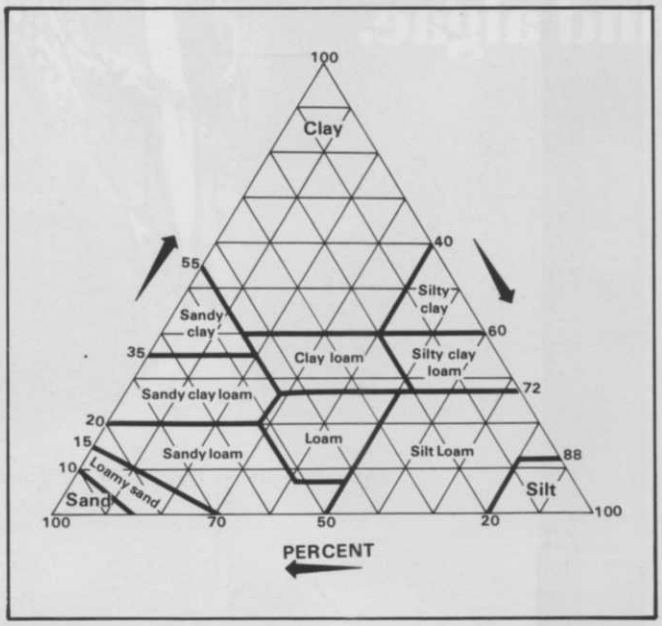

Figure 2: Textural triangle showing the various soil types.

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ity. Topsoil texture may be classified as:

Light topsoil contains a high proportion of sand. It may be possible to mold it when moist, but it will lack cohesion and fall apart easily.

Medium topsoil contains a blend of soil textures. It can be easily molded when moist but it is not sticky and does not leave a smooth polished surface when smeared.

Heavy topsoil contains a high proportion of clay. It is sticky when moist, slippery when wet, and leaves a smoothed polished surface when smeared.

Topsoil may also be classified by pH and stone content.

Soil for ordinary use may include a few stones up to 5 cm or two inches in diameter. For turfgrass areas, the larger stones need to be removed. For athletic fields, playgrounds, or where body contact is made with the soil, stone-free soil is recommended.

E-1. Topsoil classified based on its pH.

Description	pH
alkaline	more than 7.5
slightly alkaline	7.0-7.5
slightly acid	6.0-7.0
acid	less than 6.0
strongly acid	less than 5.0

Stone is defined as any inorganic particle larger than 25 mm (1 inch). The size of gravel is 2-25 mm.

E-2. Topsoil classified as to content of stone

Class	% by weight
stone & gravel free	less than 1%
slightly stony	1-5
stony	5-20
very stony	20-50
extremely stony	over 50

F. Bulk Density

Well aggregated soils, when oven-dry, may have a bulk density of 75 to 95 pounds per cubic foot. These soils at field moisture capacity would be 90-115 pounds per cubic foot.

Loamy sand has a bulk density of 82-102 pounds

F-1. Bulk Density, Porosity, and Hydraulic Conductivity of a Loamy Sand Under Various Levels of Compaction.

Compaction Intensity	Bulk Density		Aeration Porosity	Hydraulic Conductivity
	cu. ft.	cc		
	lbs.	gm	%	inches/hr.
Lowest	82	1.31	21.5	6.5
		1.45	20.8	1.4
		1.49	10.0	0.9
		1.60	11.0	0.2
Highest	1.02	1.64	10.9	0.2

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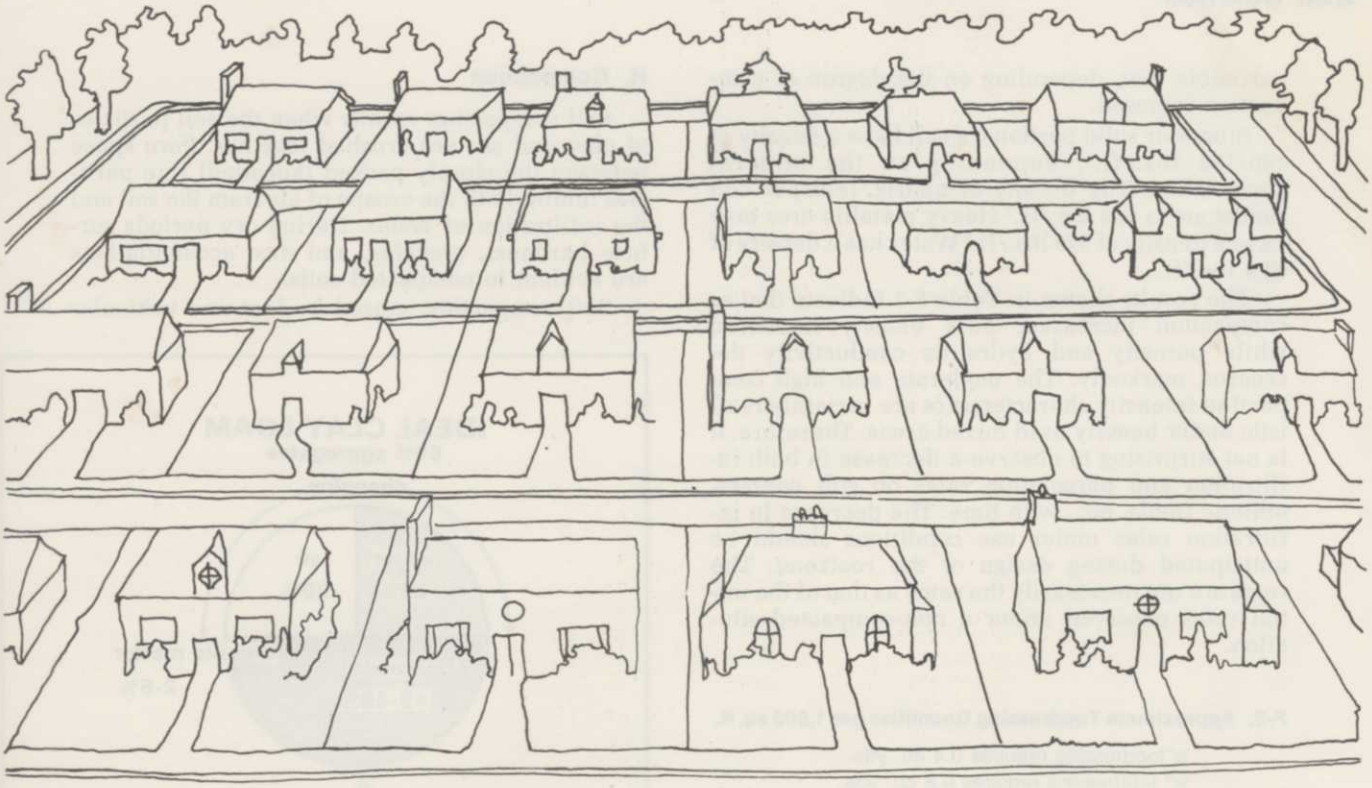

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per cubic foot, depending on the degree of compaction imposed.

Stones or solid portions of soil have a density of 166-172 lbs./ft.^{3}, depending on the mineral composition. The density of quartz, feldspar and sandstone is 166 lbs./ft.^{3} Heavy metallic ores may have a density of 370 lbs./ft.^{3} Water has a density of 62.4 lbs./ft.^{3}

The results shown in Table F-1 indicate that as compaction increased, bulk density increased while porosity and hydraulic conductivity decreased markedly. The moderate and high compaction intensity characteristics are certainly realistic under heavily used turfed areas. Therefore, it is not surprising to observe a decrease in both infiltration and percolation rates on golf courses, athletic fields, etc., with time. The decrease in infiltration rates under use conditions should be anticipated during design of the rootzone. The rates are not necessarily the same as that of the initial rates observed under a non-compacted situation.

F-2. Approximate Topdressing Quantities per 1,000 sq. ft.

⅛"topdressing requires 0.4 cu. yds.
¼" topdressing requires 0.8 cu. yds.
1" soil layer requires 3.1 cu. yds.
12" soil layer requires 36.7 cu. yds.

F-3. Weight of Soils and Materials

Material	Condition	Weight per cu. yd.	Weight per sq. meter
		lbs.*	kg
loam	loose	2200	1320
loam	compact	2550	1530
clay	compact	2700	1620
clay	wet	3050	1830
clay sand	compact	3250	1950
silty sand	wet	3100	1860
sand	dry	2700	1620
gravel		3450	2070
crushed stone		3600	2160
peatmoss	compact	450	270
peatmoss	loose	110	66
water		1690	1000

*Factor used is 0.6

H. Compaction

Soil compaction results when the soil particles of clay and silt are crushed together. Pore space between the closely packed (kneaded) fine particles inhibit both the escape of air from the soil and the infiltration of water. During dry periods surface hardness, cracking, and dust accumulations are evident in compacted soils.

Soil compaction caused by foot and vehicular

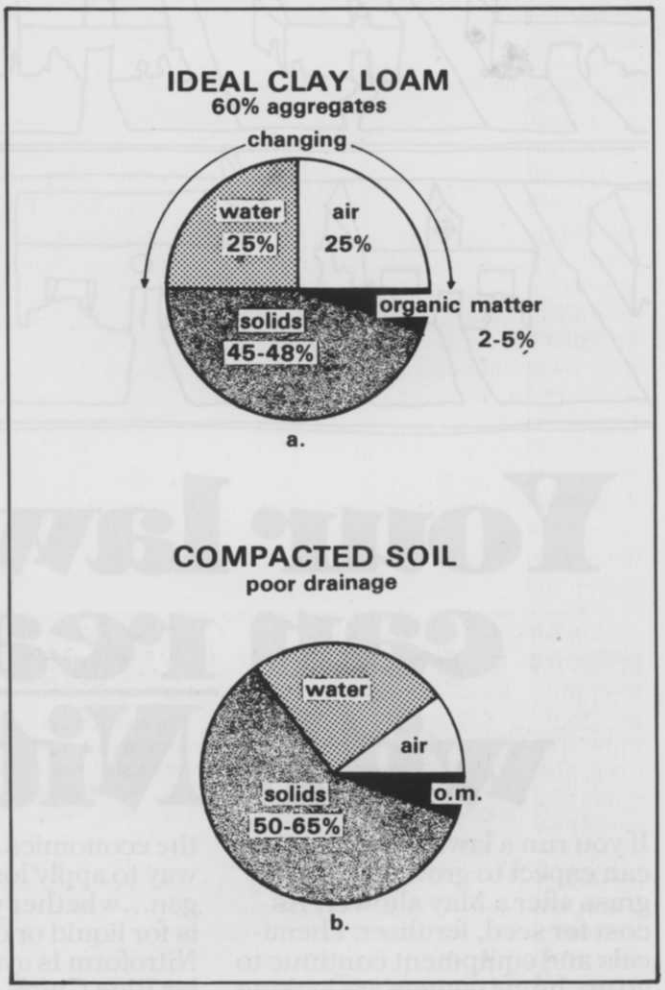

Figure 3: Circle graphs showing reduction in soil gases in compacted soil.

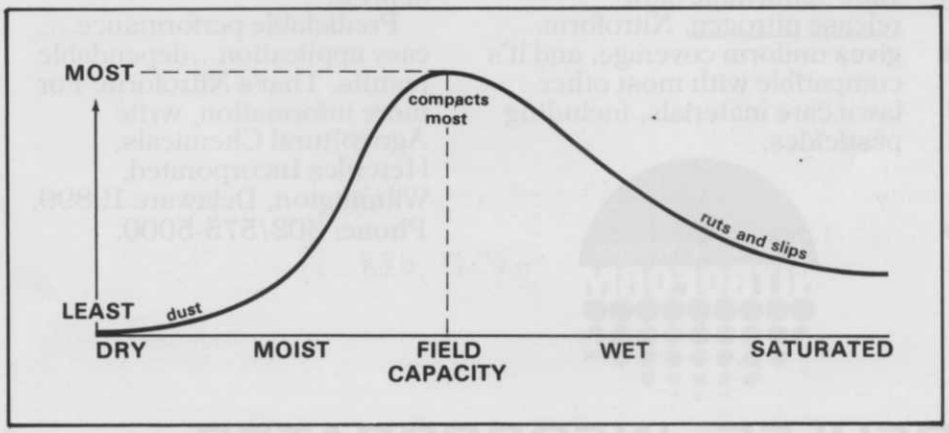

Figure 4: Most compaction occurs when the soil is at field capacity of water.

traffic is a common problem of turfgrass areas. As compaction develops, turfgrass loses vigor and density, and root growth becomes restricted because of the low oxygen supply. Table Fig. H-2 illustrates the effect of compaction in reducing non-capillary porosity in a specific soil test. The

H-2. Effect of Foot Traffic on Top Inch of Soil

Compaction	Infiltration per hour	Run-off of rain water	Non-capillary Porosity-volume
	inches	%	%
none	1.5	0	33
moderate	.7	52	19
heavy	.3	76	6

rate of oxygen diffusion is drastically reduced when only 6% non-capillary pores are present, for these may be isolated rather than continuous.

In a nine year study of compaction the air porosity decreased from 21 to 17%, while infiltration was reduced from 45 to 32 cm/hour. Heavy compaction caused a 22% lower air porosity and a 46% lower infiltration rate when compared to normal maintenance for a putting green in Virginia, 1966-74.

The finer soil particles exert more influence on soil characteristics due to their greater surface area compared to larger particles. (Fig. 4) Particles two grades smaller in textural size will pack the available space within the larger fraction. Thus 70% coarse sand combined with 30% fine sand has the drainage characteristics of fine sand.

A compacted mixture composed of 25% (weight) particles of silt and clay can effectively fill all large pores. Because of the large number of particles, the finest 10% of the soil dominates over the 90%. The 90% will have variation, which lends some effects in distribution, but the finer particles, whether mixed by nature, by cultivation or com-

H-4. Correlation of Putting Green Condition With Oxygen Diffusion Rates at Different Soil Depths

Depth	Oxygen Diffusion Rate*		
inches	good	declining	bad
2	52	15	10
4	27	15	10
12	4	4	?

*Measured in grams per square centimeter per minute (average for 20 measurements). An oxygen diffusion rate value of 20 is considered the critical level. Values below this figure will not support satisfactory growth of grass roots.

paction, will control the pore sizes or openings and thus the movement of water and air. The coarsest particles, being large and solid, actually add more

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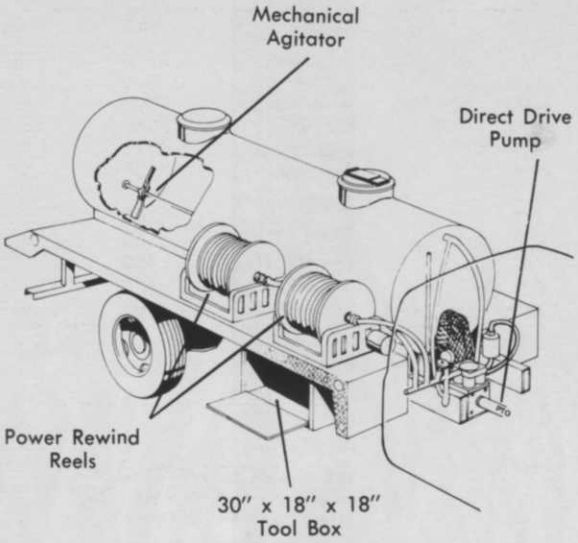

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interference than if only small particles were present.

The composition of some soils can be compared to that of concrete where gravel particles, sand, cement and water are combined so that each particle settles against and between others. The density of concrete is approximately 2.4, while the density of compacted soil mixtures ranges from 1.3 to 1.7. (See F-1).

I. Pore Space

One of the long standing practices of turf care has been the use of topdressing. Equal portions of sand, soil and peat have traditionally been used. More recently, turf managers have been increasing the proportion of sand in the mixes for topdressing.

The impact of traffic and compaction on pore space in soils should not be underestimated. The initial appearance of a topdressing mixture is altered by compaction as its structure is destroyed and only the texture contributes to pore space. The combination of topdressing components which provides the least pore space after compaction is called the "threshold proportion."

Spomer of Illinois reports 37% pore space of a compacted (single sized) monotextured particle rootzone. A graded mixture of sizes usually contains less than 27% pore space. The "threshold" value of mixes tested was 18% pore space. The mix was comprised of 100 parts sand and 36 parts "soil" mixed and compacted. Each sand and soil varies in proportions required to achieve threshold values.

An interesting fact is the pore space remaining when the sand particles are pushed together by compaction. Uniform size spheres (i.e. marbles) will have 44% pore space. Naturally occuring sand includes a variety of particle sizes. A sample of medium sand had 37% pore space. A mixture of all sizes of sand (good for making mortar) has approximately a 27% pore space. Sand diluted with silt and clay can have as little pore space as 18%. Understanding these relationships increases the appreciation of the variation found in sand and soil rootzones for turfgrass production.

The natural process of wetting and drying, freezing and thawing, granulation and compaction, root production and decay, percolation and leaching, interact with the soil mass as a continuing part of the dynamic soil process. Management programs may include mechanical cultivation to counteract compaction, sand additives to improve infiltration and earthworm activity to dilute thatch. In principle, water and air should freely go into and out of a rootzone. **WTT**

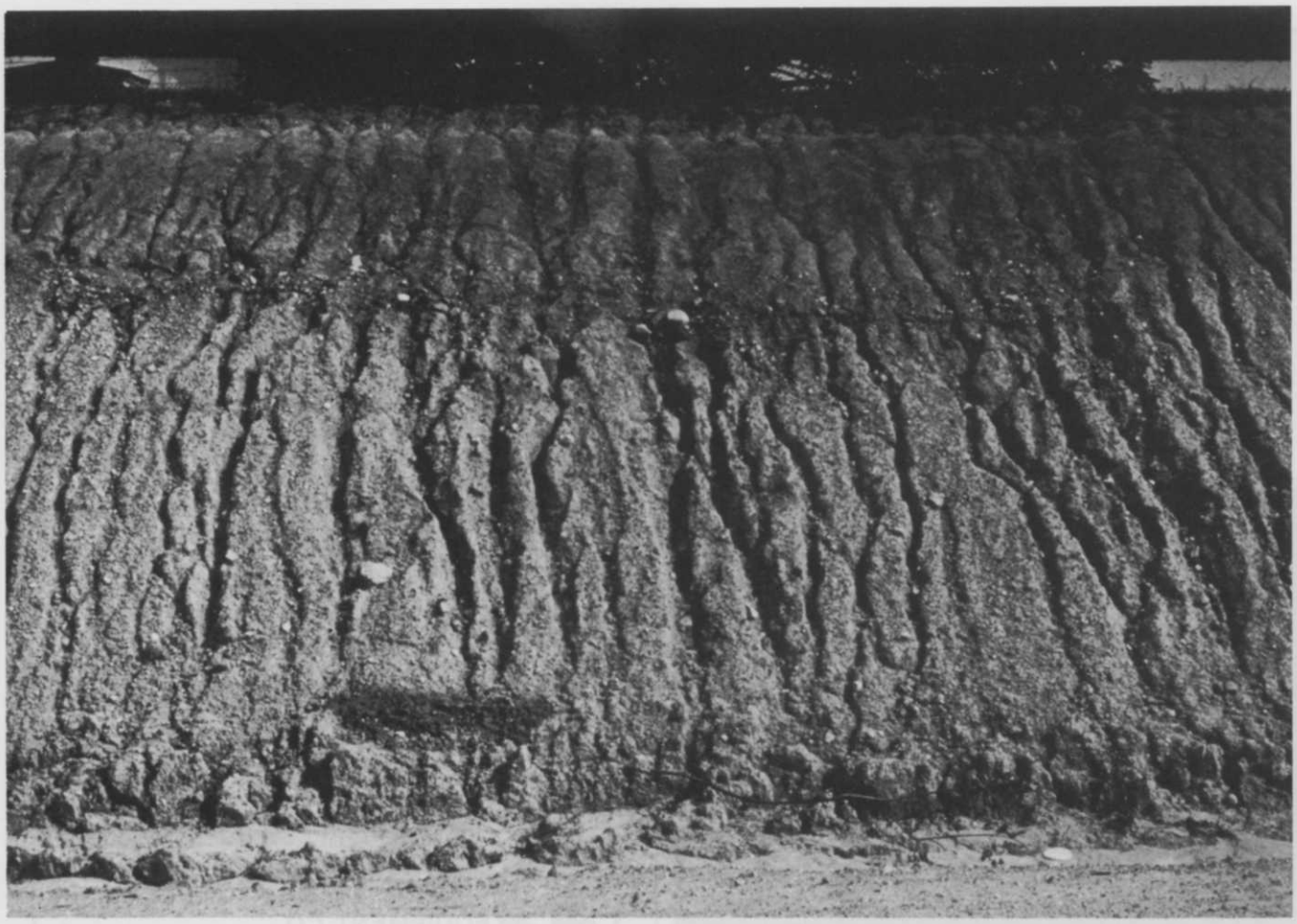

Figure 5: Eroded road cut could have been avoided by proper sodding and soil preparation.

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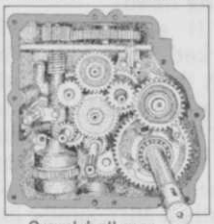

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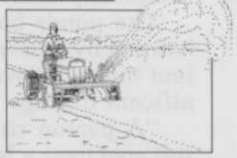

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Superintendent Uses Steel Piling To Solve Muskrat, Erosion Problems

When the grounds crew at Bay Pointe Golf Club in West Bloomfield, Michigan, declared war on an army of muskrats burrowing under the fairways and greens they found they solved erosion and mowing problems, and developed a new type golf cart bridge at the same time.

Don La Fond, superintendent for the 18 hole private course, began last fall driving lightweight steel sheet piling with a self-modified backhoe to completely encircle the course's four ponds.

The ponds had been stagnant and marshy, inhabited by muskrats often burrowing as much as 20 feet into a fairway or green, annually causing significant damage.

"A person could break his leg stepping into a soft spot over a burrow," La Fond said, "And there were plenty of burrows. We had to collapse entire areas, then re-sod. Considering the time and expense, we decided to do something preventative before the place turned into a muskrat ranch."

Opting for the ounce of prevention, Bay Pointe ordered 75 tons of lightweight steel sheet piling from L. B. Foster Co.'s Detroit office. The seven gauge piling was delivered in 4, 10, 12, and 14 foot lengths, uncoated and ready for driving.

To put down the sheets, La Fond used a highly mobile pile driver he had devised from backhoe and a flatbed truck. He bolted a heavy steel plate to the backhoe's bucket to serve as a durable battering head.

"It sounded feasible, so we did it and it worked," he said. "First we'd break the frost line with the bucket's teeth, then drive the piling with the plate until it hit solid ground.

"We used a combination of lengths, some as little as four feet, some as much as fourteen, depending on the condition of the soil. It was mostly a stiff, sandy loam, but we did hit pockets of quicksand where we had to use the longer lengths."

La Fond said the sheets were driven to an even head level in most cases, and required very little trimming in spite of the force of driving on the heads. Lightweight piling can also be driven with a jackhammer, drop hammer or any of several light pile drivers.

La Fond noted that seven gauge steel sheets are one of the few types of lightweight piling that will drive easily through soil containing buried tree stumps, roots or rocks.

"Corrugated metal bends and wood splits," La Fond said. He had installed a corrugated erosion

Corrugated sheets (lower left) show more wear even though they were installed after the piling (center).

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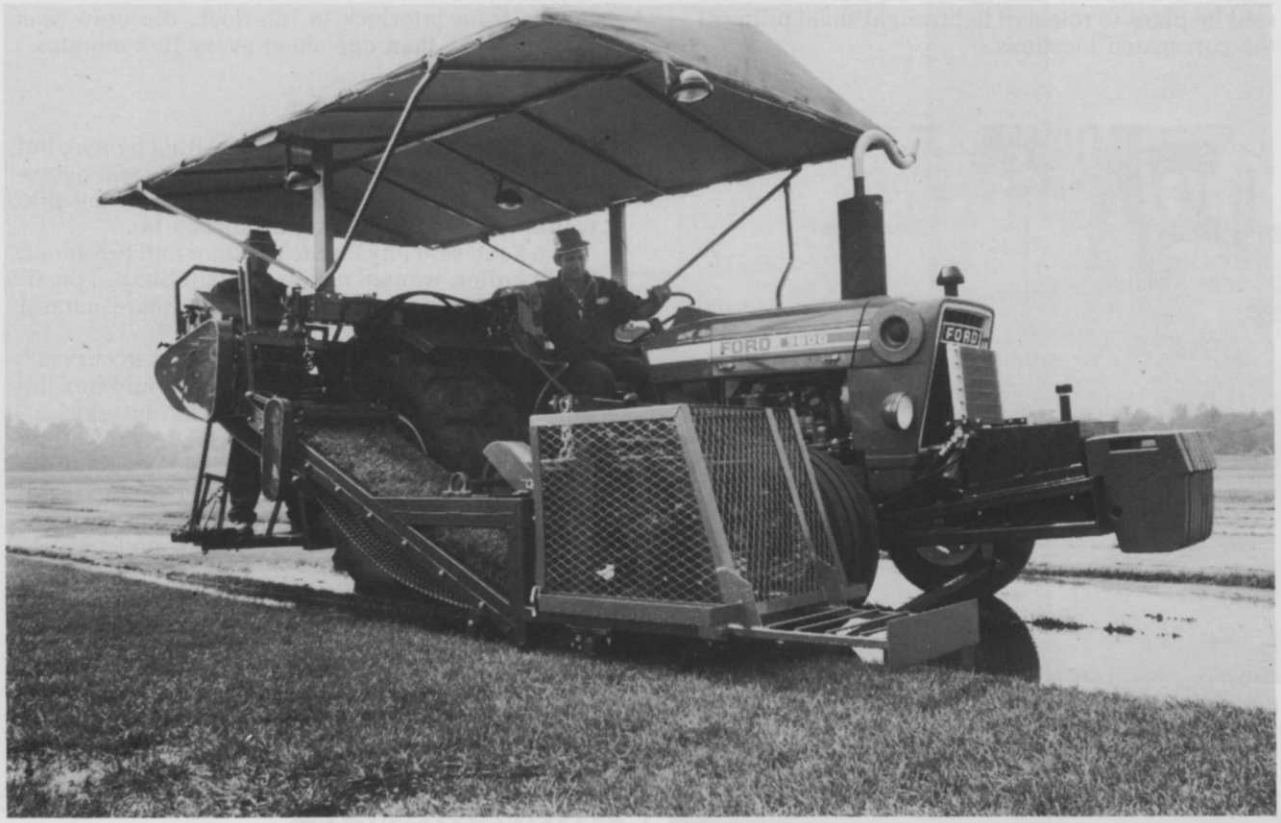

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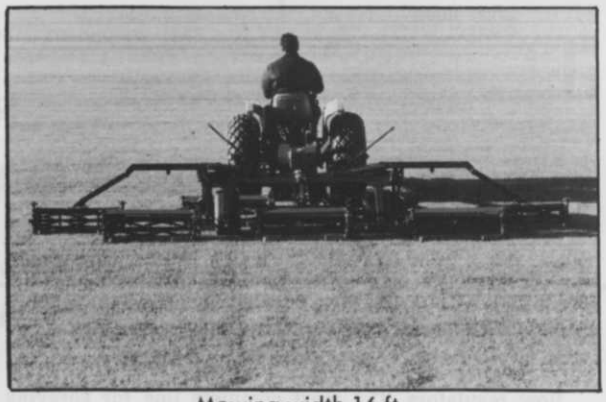
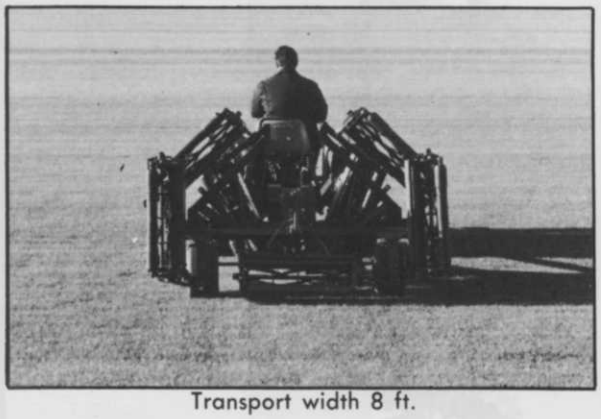


Mowing width 16 ft.



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barrier along the course's Middle Straits Lake shore, but after backfilling, the weight of the soil began to bend the corrugated outward. La Fond said he plans to reinstall lightweight sheet piling at the corrugated locations.

Bay Pointe superintendent Don La Fond Explains use of heavy steel plate on backhoe bucket to drive piling around ponds.

Using the backhoe driver system, La Fond's three man crew was able to install 120 feet of piling to grade in about six hours. As the sheets are 17.73 inches from interlock to interlock, the crew was driving more than one sheet every five minutes.

Setting The Sheets By Eye

La Fond did most of the pile setting by eye, but in places where a perfectly straight line was necessary, at a pumping station for example, the pile would be guided in along a railroad tie.

La Fond said Bay Pointe's Owner and President, Ernie Fuller, wanted as few straight lines as possible along the ponds, to make them more natural looking.

"Lightweight sheets are well suited to curves," according to La Fond. "We found we could flex the piles 16° relative to each other at the interlocks."

When the driving job is finished, steel piling caps will be installed along the top rims, and the area behind the pilings backfilled to ground level. The result, La Fond said, will be smooth, muskrat-proof shorelines, safe from erosion and easy to mow along.

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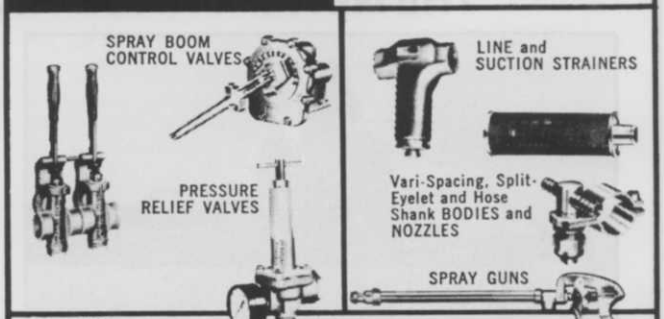

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largest pond to the highest, and then on by gravity to the other two. The gravity flow was guided by a five foot wide stream bed cutting through several fairways. It was well planned and added a new feature to the course, but it necessitated construction of two new cart bridges.

"A good wooden cart bridge with railings will cost about $900 and have to be replanked each year as golf cleats wear out the walking surface," La Fond said. "Also the railings create an unnatural, unwanted obstruction on the course."

Looking again to lightweight steel sheet piling, La Fond found that four sheets, interlocked and laid across the stream, had the qualities of a reasonably sturdy cart bridge. He then discovered that the three lengthwise channels created by the piling's shape were a perfect fit for the three wheel track of the course's golf cart fleet. The three inch deep channels eliminated the need for the obtrusive railing.

"You can actually drive the carts across the bridges with your hands off the wheel," La Fond said.

To accommodate walkers, a 1½ inch layer of cart path slag was applied to the channel bottoms, preventing metal to metal contact between cleats and bridge.

Cost of the two sheet piling bridges came to about $250, or $650 less than the cost of one good wooden span, he said.

La Fond also used lightweight piling to construct the pumping station screen gate frame. He welded two sheets back to back, and added L-shaped steel caps along their lengths to form tracks guiding a sliding screen to keep debris out of the pump. The screen slides out of the water for cleaning.

Golf cart tires fit the grooves created by four sheets of piling. Gravel placed in grooves allows golfers to avoid the grinding of cleats on the metal sheeting.

Right now, La Fond is considering lining the course's stream banks with lightweight steel piling to help prevent erosion and facilitate mowing. **WTT**

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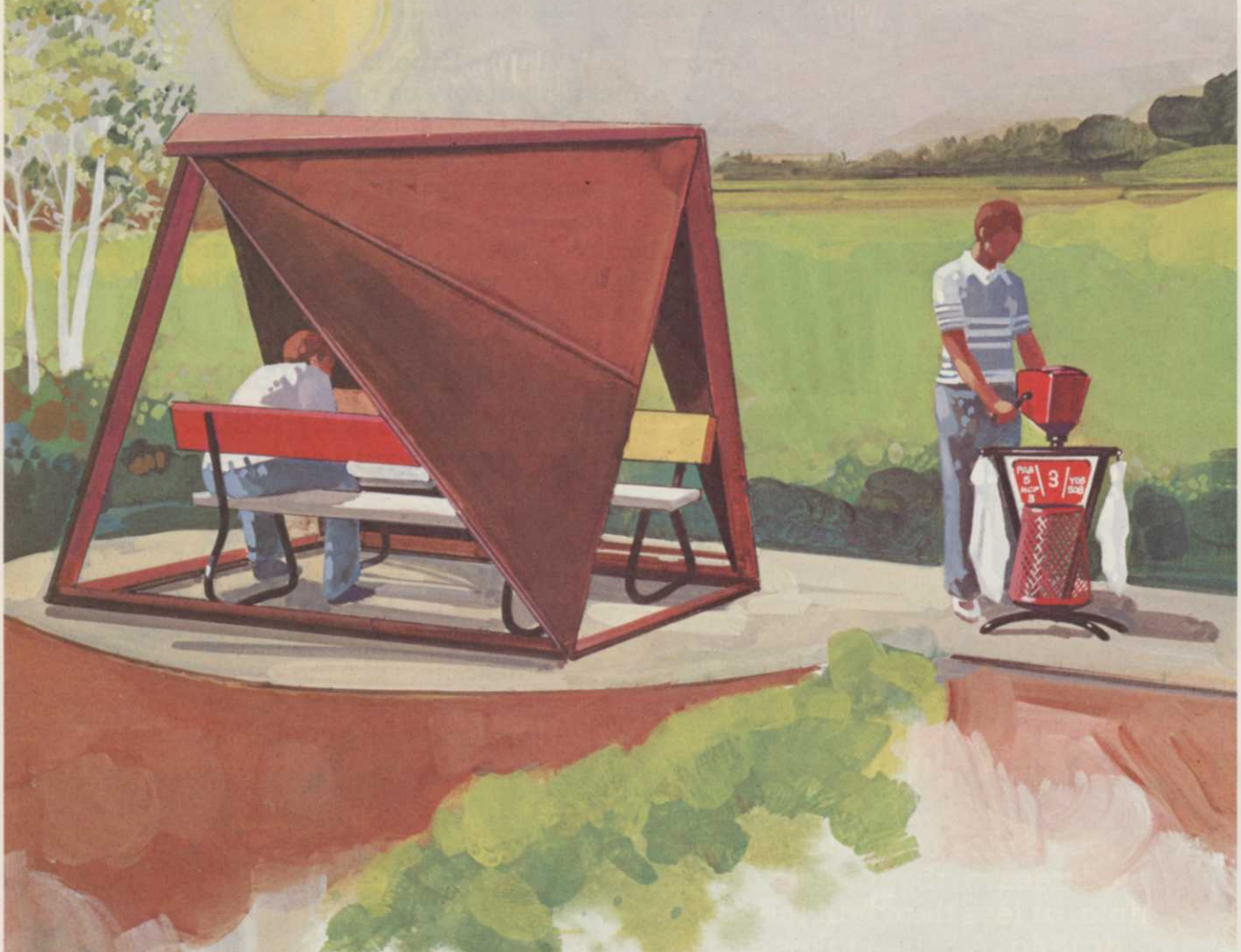

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WT&T

GREEN INDUSTRY NEWS

Continued from page 12

University. A rhizotron is an underground facility which has windows that allow scientists to observe root growth and development.

The turf rhizotron will have 30 independent observation cells plus a 14-foot square, insulated and heated underground instrument room. Scientists will be able to monitor turfgrass roots and tops and the interactions between growth, climate and soil under actual field conditions in different soil types.

SOD

Nassau conference set for sod growers

All preparations are complete for the American Sod Producers' Association Midwinter Conference, Feb. 12-15, at Nassau Beach Hotel in the Bahamas.

The theme of the conference is "helping the sod grower save dollars and do a better job in producing quality turf." Presentations will include "Tax Free Dollars You May Not Be Getting", update on seed, metrics, and insurance.

Meetings are planned to end in the early afternoon to permit the sod growers to enjoy the islands.

For further information contact the American Sod Producers, 9th and Minnesota, Hastings, Neb. (402) 463-5691.

Three Lofts Seed dealers are off to the sunny, palm beaches of the Bahamas this winter as winners of Loft's "Bahamas for Two" promotion contest. The dealers and their wives will spend eight days and seven nights in the islands. Helen Piorkowski draws the winning tickets as (l to r) Jon Loft, Bob Oberschmidt and John Morrissey watch.

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NURSERY

Florida nurserymen offer cold pointers

The Florida Nurserymen and Growers Association has offered some pointers on protecting plants from cold damage. Wrapping plants with plastic seems to cause more severe damage than when the plant is left in the open, unless there is something between the leaves and the plastic. There are two ways to successfully protect plants with plastic.

One is to build a tent over the plant on a frame and place a 100 watt light bulb beneath the tent. The heat radiated by the bulb will protect the plant. If the plant is to be wrapped, use an old blanket with some insulating qualities before covering with the plastic material.

Thirty or forty thicknesses of newspaper wrapped around the graft of a citrus tree can give it protection for temperatures in the low teens. The top may freeze completely, but the graft will survive. You should remove the paper as soon as the weather warms.

If water is used as a means of cold protection, at least ¼ inch per hour should be applied. Limb breakage from ice formation should be considered as a side effect of this method.

Regardless of the method of cold protection, some injury may result. Wait until new growth appears before doing any severe pruning. Although a plant may appear completely dead after a cold winter, do not be hasty in disposing of it. If there is a strong root system, the plant may revive. Give it sufficient time.

TREE

Echo expands distribution facility

The Kioritz Corporation of America and its Echo Chain Saw Division are going to be moving into new and expanded quarters this Spring in an announcement made by N. Rock Watanabe, President, Kioritz Corporation of America.

"The Echo Chain Saw Division, Kioritz Corporation of America has experienced growth, particularly during the last three years," said Watanabe. "The facility that we have been leasing in Northbrook has efficiently served our needs, but the current level of business and the expected growth over the next three years necessitates the move to larger quarters."

The new Kioritz facility, which will be located in Northbrook, Il., will encompass approximately 42,000 sq. ft. of warehouse and distribution space, and an additional 4,000 sq. ft. of office space.

CHEMICALS

Insecticides may have tree uses

The USDA's Agricultural Research Service is providing $7,000 to scientists at the Ohio Agricultural Research and Development Center for a two year study to determine if some insecticides currently registered for use on other plants might also be effective on orna-

Continues on page 58

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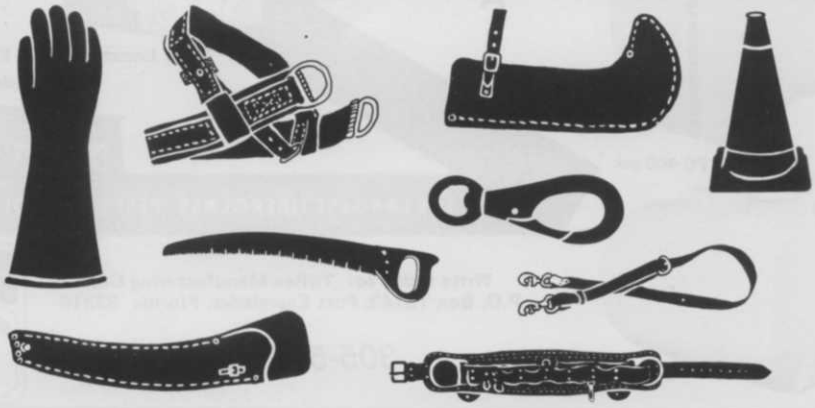

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VEGETATION MANAGEMENT

by Roger Funk, Ph.D., Davey Horticultural Institute, Kent, Ohio

TREE

Q: *One of my customers is sore because two out of five Scotch pines I planted last fall died this spring, apparently by freezing. The five pines were planted as a border to the front yard, which faces southwest and slopes downward to the street. It is in a subdivision with very few trees. What can I do to avoid another loss this spring?*

A: Practically all plant injury blamed on excessive heat or cold is due to lack of water. Summer sun and dry winter winds cause leaf and stem cells to lose water faster than roots can replace it. Cells collapse and die and plants wilt as a result.

Winter desiccation is most severe on dry, exposed, windy, and sunny sites where surface runoff of water is high. Winter killing of trees and shrubs is common, following extreme and rapid fluctuations in temperature during late fall, winter and early spring. Sudden periods of bright sun, especially when coupled with warm, drying winds greatly increase the rate of the evapotranspiration. This occurs when root absorption is retarded or prevented by cold or frozen soil. Moderately hardy evergreens and deciduous landscape plants are frequently killed or severely injured by such conditions.

Roots are more likely to freeze in poorly drained soil than in well drained soils. Trees that are very susceptible to freeze damage in poorly drained soil include ash, elm, maple, and pine. Where necessary drains can be improved by installing tile or slit trenches and sloping the surface toward an open outlet. Tree root injury is most common during winters of light snowfall or in soil without grass, mulches, or other ground cover.

Winter desiccation injury appears on broadleaf evergreens as an irregular brown scorching of the leaf tip and margin. On narrow leaf evergreens, the needles turn brown starting at the tips. These may later drop. Terminal buds and twigs dry out and become brittle and break easily when bent. Instead of leafing out properly in the spring winter injured deciduous plants may show dieback of the twigs and small branches or may even die.

To counteract desiccation during a dry autumn and early winter thoroughly water landscape plants, especially evergreens. The soil should be moist a foot or more deep. After watering, apply a three to eight inch mulch of organic material (e.g. sawdust, leafmold, wood shavings or chips). Mulching conserves soil moisture, prevents deep freezing, and averts the more serious alternate freezing and thawing that shears off feeding roots. It also delays growth in late winter or early spring until the danger of frost is past.

Protect small evergreens and hedges against leaf scorch by erecting screens on the south and southwest sides of suceptible plants. Common windbreak screens are made of glass, burlap, canvas, plastic, or straw mats. Evapotranspiration losses can be reduced on evergreens by spraying the foliage, twigs, branches, and trunks with antidesiccants such as Wilt Proof, MTF, and Foliguard in late fall. It may be necessary to repeat the spray during a mid-winter thaw if the temperature rises above 40 degrees F.

TURF

Q: *Although I'm in an area with little snowfall, there were an unusual number of days with temperatures below freezing last winter. This winter looks to be the same way. Last spring, I received an unusual number of calls from new homeowners who lost their lawns to what I think was heaving. Could you explain the causes of heaving?*

A: Contrary to popular opinion, frost heaving is not caused simply by the expansion of soil water as it freezes. When the temperature drops below freezing, ice forms on the soil surface. Water in contact with the lower surface of the ice layer eventually freezes if the temperature remains below freezing for long. As more water moves to the site of freezing, the ice layer is raised higher and higher causing the turfgrass plants to lift out of the ground.

Damage to established turfgrass is not usually severe, but frost heaving can cause significant injury to thin, poorly developed stands or late fall seeded areas. A well developed root system is a deterrent to heaving. Injury usually involves mechanical breakage of stem or root tissue or desiccation from exposure. Frost heaving is most common on fine textured soils having a high water content and no snow cover.

The potential for damage may be reduced by management practices conducive to deep rooting and by providing proper surface drainage. Injury to newly established turf areas may be avoided by good seed bed preparation, early fall seeding, and adequate soil fertility. Encouraging snow cover by the selected placement of screens may prove beneficial for small areas. A light rolling after the spring thaw, but not when the soil is too wet, will help correct the uneven turf surface caused by heaving and the resulting desiccation of crown tissue.

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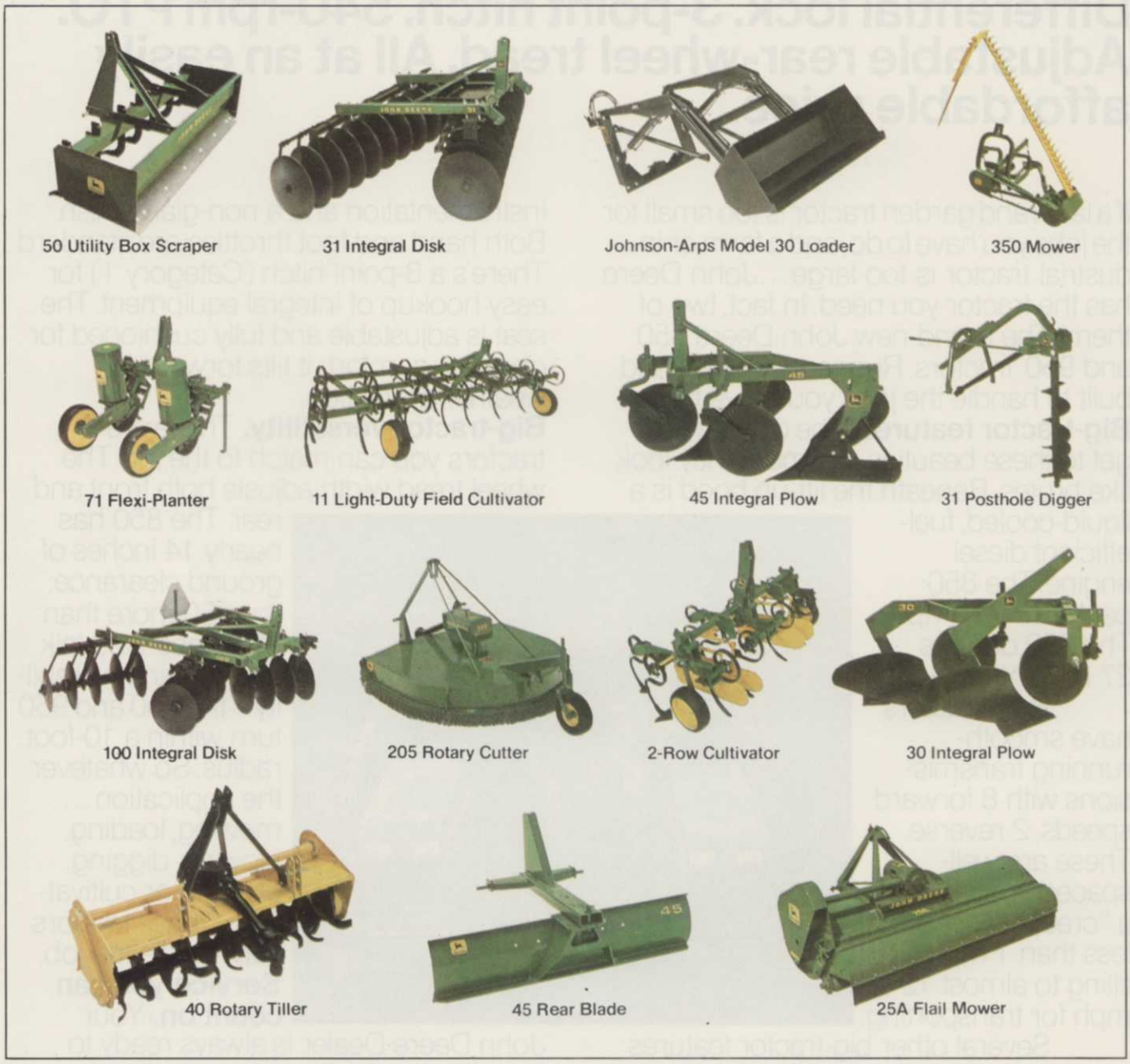

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PROSCAPE

by **Michael Hurzdan,** Ph.D., and **Jack Kidwell,** partners in Kidwell and Hurzdan, Inc., golf course architects and consultants.

Q: *It is my belief that our course is the subject of poor design. In an effort to speed up play we made it too simple. How does one go about choosing professional design assistance?*

A: All improvement planning must be done by those who have the professional expertise and experience to maximize the time and money allocated for such improvements. This is more important now than it was even 4 or 5 years ago, for several reasons. First, the cost of construction has risen to over $30,000 per hole and the cost to rebuild just one green is close to $15,000. With such large expenditures probable, it is a false economy to save a professionals fee and risk such large sums of money. This point is best illustrated by the next reason for retaining a competent golf course architect: that is, the technical sophistication of current construction methods.

The hiring of an outside golf consultant also allows the course to be viewed impartially and objectively. If improvements to courses are based on the greens committees' personal opinions and prejudice, we have a classic case of the horse designed by a committee that ends up being a camel. Further, with each change of the board you have a change in "what the golf course needs." Any improvement program that must run one or more years must have a thread of continuity that keeps the progress moving in one direction.

Lastly, any improvement to a course should be based on accepted design standards to avoid possible legal complications later.

It is natural that not all golf course architects, of which there may be as many as 250, will have the same approach to an improvement plan or study. Therefore this professional should be very carefully selected, so that the long-range objectives of the club are fulfilled. The golf course architect should not be selected only on the basis of reputation or the number of advertisements in magazines. Rather the golf architect should be hired on the basis of his past performance with nearby clubs, his personal philosophy of golf, his demonstrated knowledge of technical matters, and his projected schedule of planning and inspection visits. In our opinion, the golf architect should be "local" to the area, so he is accessible to provide maximum inspection of all improvements. The implementation phase of the design process is as important as the planning phase.

Further, the golf course architect should do all planning within the guidelines provided by the improvement committee. This will help insure consistency with the club's goals and objectives.

After the club has interviewed several firms and selected the golf course architect, the process is for the club to provide the architect with a recent, scaled aerial photograph and matching topography. The most inexpensive source of these maps is through the county or state highway department.

Once the golf architect has these scaled maps, he is ready to analyze the course. He should walk or play each hole, looking at it from many different points, to internalize the conditions faced by golfers of all skill levels and by the golf course superintendent. Once he understands the design intent of the hole, and existing maintenance problems, he begins to evaluate what improvements might be made to solve problems in a manner consistent with the strategy of the hole.

Finally, the architect should make a list of priorities of work that should be done and also provide a rough estimate of the cost of these improvements by hole.

The cost of such a study can be either a flat fee or based on an hourly rate. Since the planning phase is so important, it is good economy not to be overly restrictive on the golf architect's time. An average study will involve 100 to 125 hours of work including meetings, time on the course, travel, design and drafting time, and presentations. It should be noted that these are not construction drawings, but only schematic plans showing relative size, shape, and position of improvements. Before actual construction begins, detailed construction drawings are required, usually covered under a new agreement with the architect.

Detailed drawings and specifications permit the contractor to bid intelligently and more competitively, for all elements of construction are fully defined — so there is little guessing about labor and materials needed. To build a green or golf course with only routing plans or a rough drawing is like building a house with only a floor plan. It can be and is done, but it usually forces the contractor to over-estimate his projected cost because he can not accurately define and estimate the extent of his problems and liability.

We also consider it grossly unfair for an improvement committee to force a superintendent to be responsible for construction work. For if all works well, then it is expected and little thanks is given — if not, the superintendent must bear the blame and perhaps lose his reputation or job.

Proscape is a free problem solving service for any residential, industrial, and golf course landscaping topic. Questions are answered by various experts in the field of landscaping, chosen for their knowledge of the subject in question. Write your questions for PROSCAPE on the postpaid reader question card in this issue.

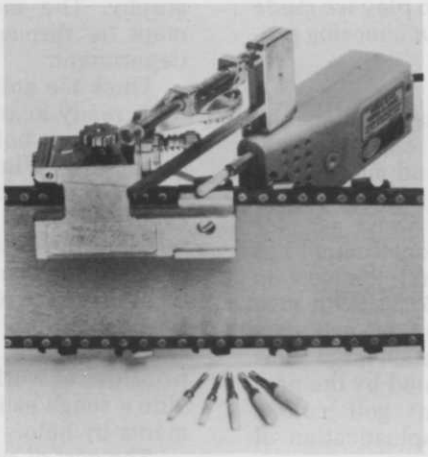
PRODUCTS

MULTI-PURPOSE LOADER from Sperry New Holland is more than just a little shovel. It can, with proper attachments, load pallets, be a backhoe, dig trenches, and transplant trees. Models range from 22 horsepower with 900 lbs. operating load to 62 horsepower with operating loads of more than a ton, all with skid steering. Featured are long dump reach, long wheel base for stability, hydrostatic drive, and easy access to the engine for service.

Circle 701 on free information card

SOIL TEST LABORATORY from Hach Chemical Co. is self-contained for on-site tests of soil nutrient and pH levels. All chemicals and needed apparatus are packaged in a black plastic carrying case. The lab operates either on batteries or AC and weighs 14 lbs. The lab carries reagents for 50 each of six different tests.

Circle 702 on free information card



PRECISION GRINDER by Granberg clamps onto the chain saw bar and holds the links to be sharpened, assuring accuracy and consistency of cutter angles and depth gauge clearances. The grinder is equipped with a 12 volt motor for in-the-field sharpening.

Circle 703 on free information card

COMPATIBILITY AGENT from Hopkins Agricultural Chemical Co., is used with liquid fertilizer/pesticide mixtures to insure uniform mixing and dispersion, prevent separation, coagulation, and other unwanted changes. Called Unite, the agent is designed for use when mixing a combination of emulsifiable liquids or wettable powders.

Circle 704 on free information card

FRONT MOWING TRACTOR from Jacobsen Manufacturing Co. features hydraulically powered reels for cutting swaths up to 15 ft. through both rough turf and fine grasses. Adjusted cutting frequencies of the HF-15 tractor remain constant because the reels rotate independently of tractor speed. Individual controls let the operator hydraulically adjust mowing swath from one to seven gangs. Each reel can be reversed to discharge debris. The reels are centered between free turning carrier wheels to help prevent scalping and to eliminate the need for rollers or skids.

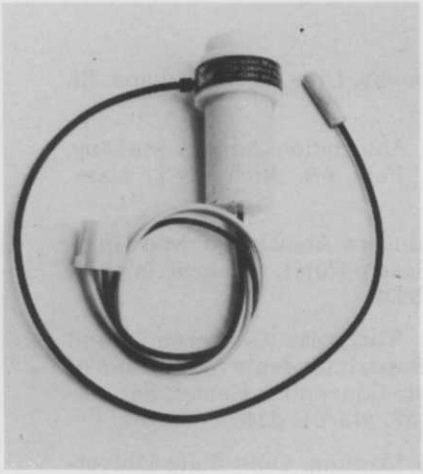
Circle 705 on free information card

DUMP BODY by Pac Craft Products, Inc., converts a standard size pickup truck into a 2½ cu. yd. dump truck. A new design enables the Sert-A-Dump to be attached to a pickup without drilling holes or damaging the truck body. Adjustable outriggers hold the dumper in place. Hydraulic components operate off a power pak that receives DC current from the truck battery and are guaranteed for one year. The dumper can be switched to a new truck in a matter of minutes.

Circle 706 on free information card

WT&T

PRODUCTS



MOISTURE SWITCH and meter for sprinkler irrigation systems is new from Agtronics Manufacturing Co. The Model 8500 moisture switch measures moisture through a sensing device buried in the ground which transmits the moisture content through a pneumatic system which can turn on or off a sprinkler irrigation system. The device needs no servicing once installed.

Circle 707 on free information card

WET-WEAR OVERALLS by Edmont-Wilson resist chemicals, water, oils, and snags and are designed for worker comfort. Made of layers of nylon net and vinyl film, the overalls have welded seams to keep liquids out. The overalls are lighter, provide more space in crotch and chest areas, and have elasticized suspenders for more comfort to the wearer.

Circle 708 on free information card

GROUNDS TRACTOR with 26 horsepower is new from Gravely. The GMT 9000, with optional 72-inch, center mount rotary mower and 50-inch wing deck, cuts nearly a ten-foot swath. An operator can mow as many as 33-acres in an eight-hour day. Other features are a water-cooled Continental 26 horsepower engine, Power steering, individual wheel brakes, eight-speed transmission, and three-valve hydraulic system. Options include plows, cultivators, carts, snowblowers, seeders, sprayers, aerators, and a cab.

Circle 709 on free information card

THREE POINT MOUNT LIFT by Edwards Equipment Co., has a 4,000 lbs. capacity. The fork lift is designed for tractors with category two and three hitches for lifting, moving, and loading palletized material, bins and other heavy bulky objects. The TT 5000 permits easy on and easy off to free the tractor for other uses.

Circle 710 on free information card

PREEMERGENT HERBICIDE from Rhodia Inc., has recently received registration for turf and ornamental uses. Chipco Ronstar G can now be used as a selective, preemergent herbicide for control of germinating crabgrass, poa annua, goosegrass, oxalis, stinging nettle, carpetgrass, pigweed and Florida pusley in established perennial bluegrass and bermudagrass turf. In ornamentals, the herbicide can be applied on newly planted field and container stock.

Circle 711 on free information card

FIBERGLASS TURF SPRAYERS

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TL10 and 40 Series

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Myers fairway and general turf maintenance sprayers offer non-corrosive fiberglass construction throughout. Agitator assembly is stainless steel. Wide choice of optional running gear. PTO or engine drive. 100 and 200 gallon tanks. Write for our catalog.

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Circle 123 on free information card

EVENTS

International Society of Arboriculture, Ohio Chapter Annual Meeting, Sheraton-Columbus, Columbus, Ohio, Jan. 22-26.

Ohio State University Nursery Short Course, Sheraton-Columbus, Columbus, Ohio, Jan. 22-26.

Mid-Atlantic Agricultural Chemical Trade Show. Virginia Pesticide Association Annual Meeting, State Fairgrounds, Richmond, Va., Jan. 25-26, Terry Rock, Va. Pesticide Assoc., P.O. Box 7494, Hollins, Va. 24019.

USGA Green Section Annual Conference on Golf Course Management, Mark Hopkins Hotel, San Francisco, Ca., Jan. 27.

Southern Turfgrass Conference & Show, Southern Turfgrass Association, Broadwater Beach Hotel, Biloxi, Miss., Jan. 29-Feb. 1, 601/325-6161.

Associated Landscape Contractors of America Annual Meeting & Trade Exhibit, Hyatt House, Orlando, Fla., Jan. 30-Feb. 3, 703/893-3140.

Illinois Commercial Arborist Association, University of Illinois Annual Arborist's Seminar, Sheraton-O'Hare Motor Hotel, Rosemont, Ill., Jan. 30-Feb. 2, 312/991-1160.

International Society of Arboriculture, Midwestern Chapter Annual Convention, Sheraton-O'Hare Motor Hotel, Rosemont, Ill., Jan. 31-Feb. 2, Marvin DeSmidt, president, 5633 Durand Ave., Racine, Wisc. 53406.

Michigan Forestry and Park Association Annual Meeting, Kellogg Center, Michigan State University, East Lansing, Mich., Feb. 1-2, Bob Newmann, Jr., 517/355-2286.

N.Y. Turf & Landscaping/Long Island Gardners Association Annual Turf & Landscape Conference, Tappan Zee Inn, N.Y., N.Y., Feb. 1.

Fertilizer Institute Annual Meeting, Regency Hyatt, Chicago, Ill., Feb. 5-7, 202/466-2700.

Landscape/Garden Center Management Clinic, National Landscape Association, Galt House, Louisville, Ken., Feb. 5-8, 202/737-4060.

National Limestone Institute Annual Convention, Capitol Hilton, Washington, D.C., Feb. 5-8, 703/273-8517.

International Society of Arboriculture, Rocky Mountain Chapter Annual Meeting, Denver Merchandise Mart, Denver, Colo., Feb. 6-7.

Pennsylvania Nurserymen's & Allied Industry Conference, Feb. 7-9, 717/243-1786.

Weed Science Society of America Annual Meeting, Dallas Hilton, Dallas, Tex., Feb. 8-10, F. W. Slife, Dept. of Agronomy, Univ. of Ill., Urbana, Ill. 61801.

Wisconsin Arborist Association Annual Meeting, Green Bay, Wisc., Feb. 8-9, Richard T. Hasa, 554/002-3666.

American Sod Producers Association Midwinter Meeting, Nassau Beach Hotel, Bahama Islands, Feb. 12-14, 402/463-5691.

49th International Turfgrass Conference and Show, Golf Course Superintendents Association of America, San Antonio Convention Center, San Antonio, Tex., Feb. 12-17, 913/841-2240.

Horticultural Trade Meeting, Ohio State University Cooperative Extension Service, Holiday Inn, North Randall, Ohio, Feb. 14-15, 212/262-8176.

Golf Course Builders of America Annual Meeting, San Antonio Convention Center, San Antonio, Tex., Feb. 15.

Illinois Landscape Contractors Association Annual Seminar, Indian Lakes Country Club, Bloomingdale, Ill., Feb. 16-17, 312/894-4774.

American Society of Consulting Arborists Annual Meeting, Sarasota Hyatt House, Sarasota, Fla., Feb. 16-18, 201/821-8948.

National Arborist Association Annual Meeting, Sarasota Hyatt House, Sarasota, Fal., Feb. 19-23, 516/221-3082.

Capital Area Turf School, Hershey Motor Lodge, Hershey Penn., Feb. 21-22.

Western Pennsylvania Turf School/Trade Show, Howard Johnson Motor Lodge, Monroeville, Penn., Feb. 21-23.

Pest Management Seminar, Target Chemical Co., Anaheim Convention Center, Anaheim, Ca., Feb. 22, 213/921-7707.

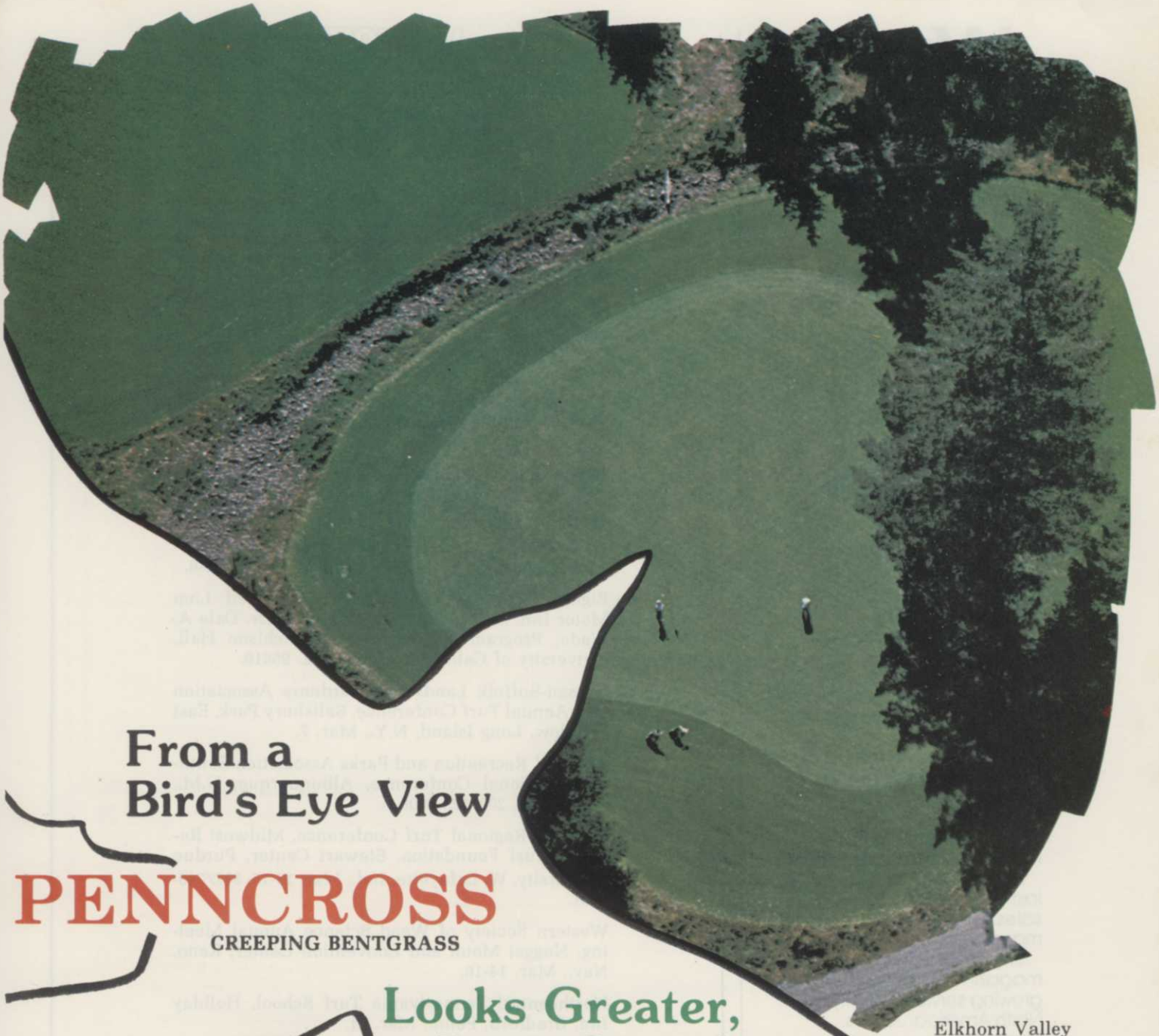
National Recreation and Parks Association Pacific SW Regional Conference, Fresno Ca., Feb. 25-28, 414/733-2301.

American Society of Golf Course Architects Annual Meeting, Carefree Inn, Phoenix, Ariz., Feb. 26-Mar. 3, 312/372-7090.

International Society of Arboriculture, Southern Chapter Annual Meeting, Sheraton Motor Inn, Fredericksburg, Va., Feb. 26-28.

Irrigation Association Annual Irrigation Technical Conference, Stouffers Cincinnati Towers, Cincinnati, Ohio, Feb. 26-28, 301/871-1200.

Iowa Turfgrass Conference, Hilton Inn, Des Moines, Iowa, Feb. 27-Mar. 1.



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The putting grass superintendents prefer. Easy to establish, lower maintenance costs.

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LAWN CARE INDUSTRY

EVENTS

47th Massachusetts Fine Turfgrass Conference and Exhibition, Springfield Civic Center, Springfield, Mass., Feb. 28-Mar. 2, Mass. Turf and Lawn Grass Council, P. R. Scagnetti, The Clapper Co., 1121 Washington St., W. Newton Mass. 02165.

Northeastern Pennsylvania Turf School, Master Host Inn, Wilkes-Barre, Penn., Feb. 28.

"Tree Stresses" Short Course, University of Missouri-Columbia, Feb. 28-Mar. 1, John P. Slusher, 314/882-4444.

29th Annual Canadian Turfgrass Show, Canadian Golf Superintendents Association, Hotel Toronto, Toronto, Ontario, Canada, Mar. 5-8, 416/767-2550.

Wisconsin Landscape Federation 1978 Conference, Concourse Hotel, Madison, Wis., Mar. 5-6.

Eighth Vertebrate Pest Conference, Red Lion Motor Inn, Sacramento, Ca., Mar. 7-9, Dr. Dale A. Wade, Program Chairman, 554 Hutchison Hall, University of California, Davis, Ca. 95616.

Nassau-Suffolk Landscape Gardners Association 10th Annual Turf Conference, Salisbury Park, East Meadow, Long Island, N.Y., Mar. 7.

National Recreation and Parks Association Southwest Regional Conference, Albuquerque, N.M., Mar. 12-14, 202/525-0606.

Midwest Regional Turf Conference, Midwest Regional Turf Foundation, Stewart Center, Purdue University, W. Lafayette, Ind., Mar. 13-15, 317/749-2891.

Western Society of Weed Science Annual Meeting, Nugget Motel and Convention Center, Reno, Nev., Mar. 14-16.

Northcentral Pennsylvania Turf School, Holiday Inn, Bradford, Penn., Mar. 21.

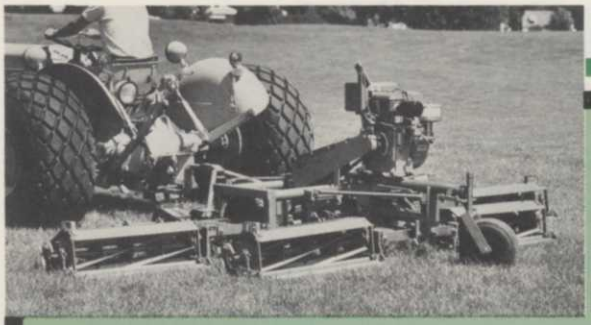
National Recreation and Parks Association Southern Regional Conference, Biloxi, Miss., Apr. 2-4, 202/525-0606.

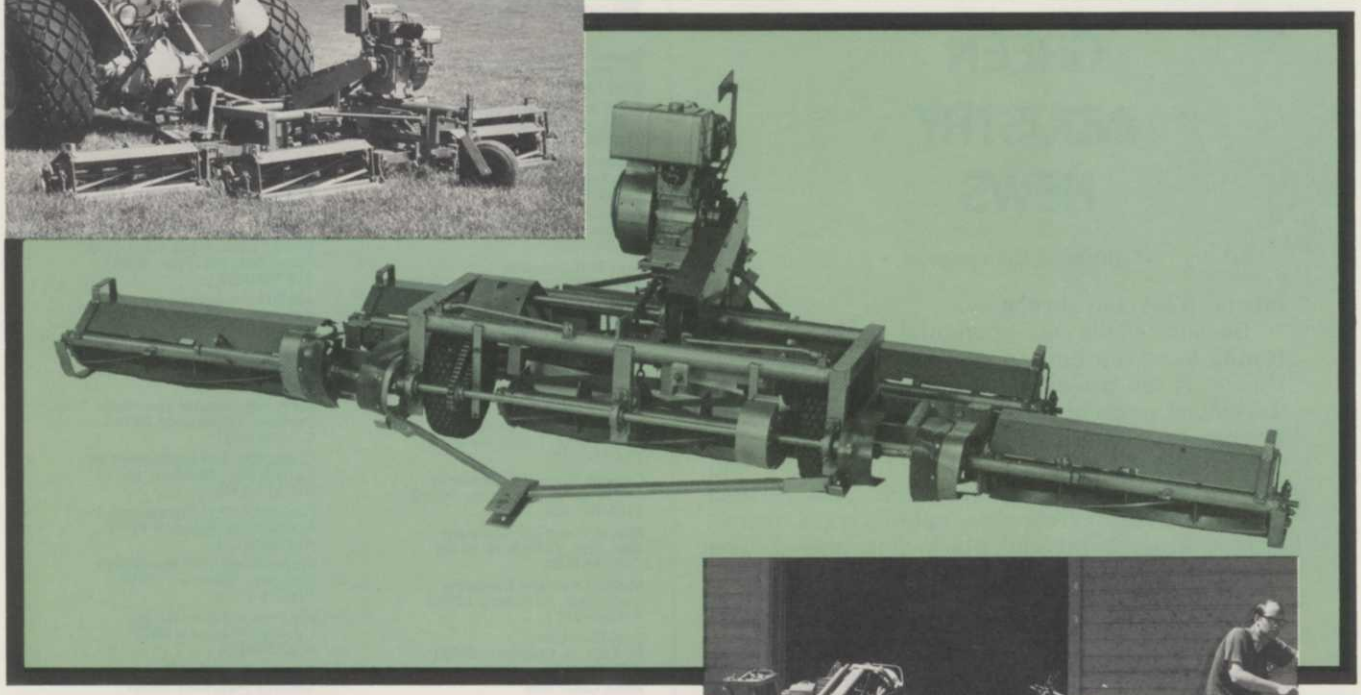
Williamsburg Garden Symposium, Williamsburg, Va., Apr. 2-5, 804/229-1000 Ext. 2365.

National Recreation and Parks Association Pacific NW Regional Conference, Yakima, Wash., Apr. 8-12, 202/525-0606.

American Horticultural Society Spring Symposium, Mills Hyatt House, Charleston, S.C., Apr. 9-12, 703/768-5700.

Pennsylvania Recreation and Park Society 31st Annual Conference, Downington Inn, Downingtown, Penn., Apr. 9-12, James G. Smith, 215/MU 6 1776 Ext. 49781.





NATIONAL MOWER'S NEW Power Quint

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National Mower's Power Quint is designed to meet the demands of today's economy. It is priced less than any comparable unit. It is a simple, functional machine without unnecessary levers, gadgets and chrome decorations. It is made so as many parts as possible are standard, off-the-shelf items available from the user's local sources.

Power Quint was deliberately designed to provide its own power source. A feature that allows the unit to be pulled by almost any size tractor with or without PTO.

FEATURES:

- ☐ Five, powered, free-floating reels cut an 11½ foot swath without skip or scalping.
- ☐ Wings fold to 68" for easy transport and storage.
- ☐ With no need for outrigger wheels, cutting units reach out over curbs, golf course traps and up to obstruction to eliminate trimming.
- ☐ Unit is easily backed out of difficult areas and quickly negotiates inclines because powered reels produce less drag.

As with all National Mower models, the Power Quint reels are designed to adjust down to fixed bed bars providing for more rigid, longer-lasting mowing units. All bed knives have turned-up lips for extra wear . . . a feature National introduced as early as 1925.

84" TRIPLEX

National's 84" Triplex is one of the best hill-climbing, rough terrain machines made today. Operates as efficiently on an 83 per cent grade as on a level. Its no-nonsense design makes maintenance easier and faster.

68" TRIPLEX

With its low center of gravity and wide track, National's Model 68 maneuvers sharply, climbs banks and hillsides easily and safely. Unit mows a 68-inch swath at speeds up to 4 MPH . . . that's half an acre in 15 minutes. Wings fold to 37½".

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GREEN INDUSTRY NEWS

Continued from page 44

mental trees and shrubs.

Because of the small potential market, product testing has been limited on oranmental trees and shrubs. If the project is successful, some already developed pesticides may be found effective and become registered for use on ornamentals.

Insecticide effectiveness in both field and greenhouse will be determined. The various targets include leafhoppers, aphids, lygus, thrips, bronze birch boret and black vine weevil. The researchers hope to find effective controls to protect such ornamentals as honey locust, white birch, azeala, rhododendron, taxus, flowering trees and shade trees.

Dr. David G. Nielson will be the principal investigator for OARDC. Dr. Thryil L. Ladd, research leader at the ARS Japanese Beetle Laboratory, Wooster, will represent ARS on the project.

Bob Earley, editor of LAWN CARE INDUSTRY magazine, points out the rapid growth and great potential of the lawn care industries. Earley spoke at the recent Ohio Turf Conference in Dayton.

Richard B. Craig, superintendent at Jack Nicklaus Golf Center, Kings Island, Ohio, discusses a successful lake management program. Speaking at the Ohio Turf Conference, Craig suggested German carp from Lake Erie as a solution to algae problems.

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CLASSIFIEDS

When answering ads where box number only is given, please address as follows: Box number, c/o Weeds Trees and Turf, Dorothy Lowe, Box 6951, Cleveland, Ohio 44101.

Rates: All classifications 65¢ per word. Box number, $1. All classified ads must be received by Publisher the 5th of the month preceding publication date and be accompanied by cash or money order covering full payment. Mail ad copy to: Dorothy Lowe, Weeds, Trees & Turf, P.O. Box 6951, Cleveland, Ohio 44101.

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SOD QUALITY Seeds: Merion, Flyking, Delta, Park, Newport, Nugget, Adelphi, Cheri, Glade and Baron bluegrasses also fine fescues. Manhattan ryegrass. Custom mixing available. Michigan State Seed Co., Grand Ledge, Michigan 48837. Phone 517 627-2164.

USED EQUIPMENT

2 — 50' AERIAL BASKETS — 1-65' Aerial basket, 2 Asplundh brush chippers. 1 Vermeer tree mover, 1 Vermeer stump cutter. Small hydraulic crane, 2 John Bean sprayers, ten ton tri-axle trailer, 1 Prentice log loader, tractor with front end loader and Bobcat loader, Parkway Tree Service, 12026 W. Cherry, Wauwatosa, Wis. 53226. 414 257-1555.

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FOR SALE: 1974 Vermeer 2460 A stump cutter, like new. A 1560 Vermeer stump cutter, fair condition. 1974 Fitchburg chipper, 16" blades, V8 motor with blower, 3 sets of knives, 350 hours. 1967 Dodge D700, 12' dump with Hiab crane, truck fair, crane excellent. 1972 Wayne chipper 16" blades, 3 sets of knives, 400 hours, excellent. More chippers and stumpers not listed. 1962 International 6 wheel drive cargo body, 10,000 miles, like new. Call 413 786-0522 after 5:00. Greg Nowill, P.O. Box 27, Feeding Hills, Mass. 01030.

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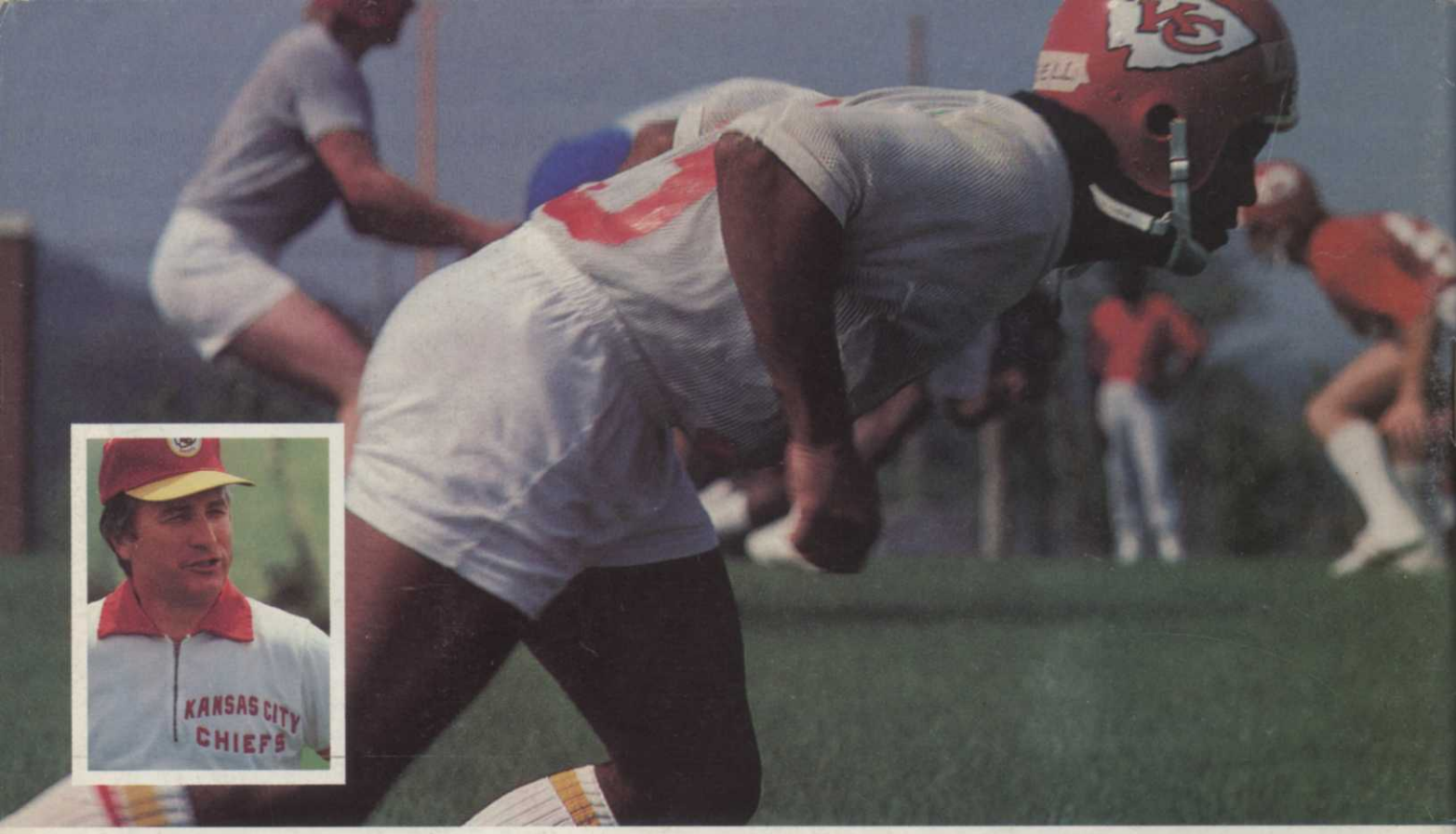

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